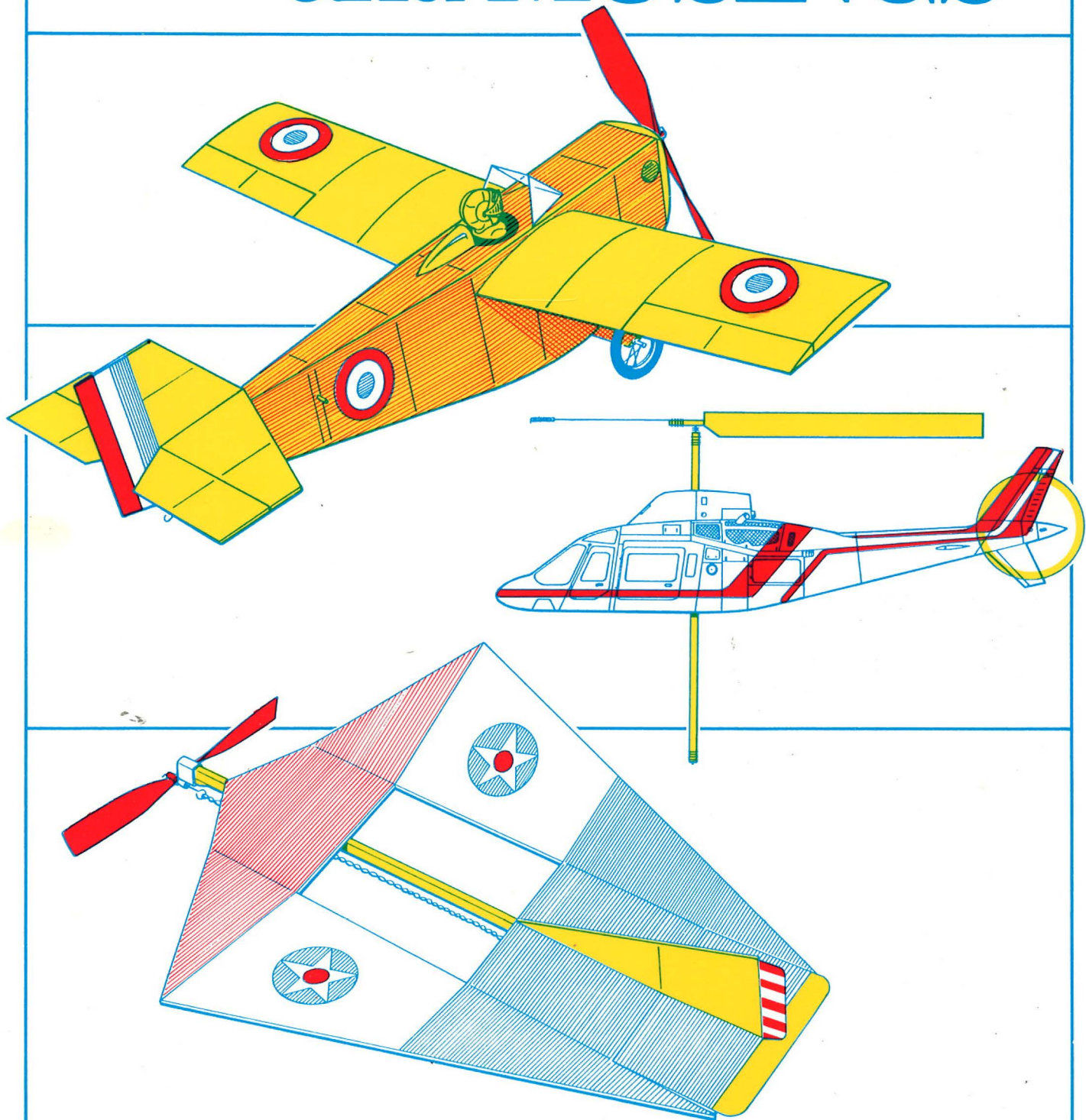


MODELS and MUSINGS



Low in technology but high in **FUN**... by BILL HANNAN

MODELS and MUSINGS

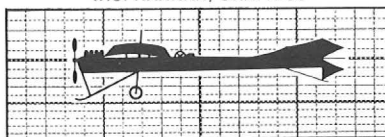
by **BILL HANNAN**

"Avec de la patience, on arrive à tout."
(With patience, one arrives at everything.)

Old French saying

Sincere thanks to Richard Miller for his editorial and philosophical support.
And to Warren D. Shipp, aero historian/modeler/friend extraordinaire.

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Dedicated to the innovators . . . past, present and future . . .



INTRODUCTION

Within these pages are gathered a selection of items culled, for the most part, from the author's published magazine articles. We apologize for the loss in reproduction quality engendered by the scrapbook approach. In some cases the material has been condensed and/or revised for this publication. Other items may be appearing here for the first time.



S.C. and Genevieve Hannan

Grandfather Hannan owned a strip of land adjacent to the Billings, Montana, airport during the 1920s and '30s, and had many aviator friends. During the early 1930s, he arranged a Ford trimotor ride for the author, likely launching a life-long interest in aviation.

ACKNOWLEDGEMENTS

Special recognition is due the various editors and publishers who featured these articles originally, as well as those who contributed to the present volume. Grateful thanks are extended to the following, as well as anyone that may have been inadvertently overlooked:

Larry and Dottie Conover
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The late Glen Sigafoose
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Earl VanGorder
Carl Wheeley
Bill Winter

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(carefully arranged in no particular order)

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BACK COVER PHOTOGRAPHS

Corky Cat upstaging "Stringless Wonder."

Doreen Virtue displaying "One Knight in Boston."

Zona Appleby and the late Max Holtzem with "low-tech" models. Zona holds a "Boxy Bipe" while Max has Warren Shipp's triplane. The full-size Fokker triplane in the background was constructed by Jim and Zona Appleby's Antique Aero Limited.



FOREWORD

Miniature aircraft were flown well in advance of the man-carrying variety. Interest in models was world-wide and included experiments such as those by Cayley and Stringfellow of England, Pénaud and Tatin of France, Forlanini of Italy, and Hargrave of Australia.

Today, modeling continues to fascinate. In addition to being an entertaining hobby, it fosters useful abilities such as plan reading, correct use of tools and pride in craftsmanship, scarce and precious commodities in this age of automation. It also offers the simplest and most direct way of learning about aerodynamics.

Aeromodeling involves both skill and luck; it is both simple and difficult, offering genuine FUN and satisfaction for those willing to invest patience and enthusiasm.

ONE MAN'S PLANS?

Not really. Generations of model builders have contributed directly or indirectly to inspiring these models, and probably none is truly original. As Jiro Horikoshi, of Japanese "Zero" fame put it:

"... virtually all competent aeroplane designers will hold with me, the business of creating any new aeroplane is a process of adopting the existing art and science to the problem at hand." (quoted in the December 1956 **RAF Flying Review**)

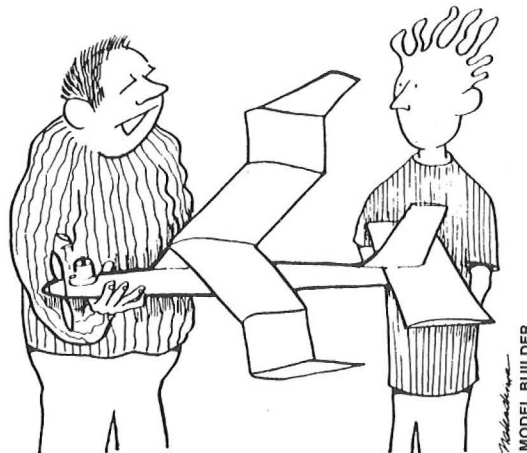
And it has been flattering to see the number of features from these models "adopted" over the years in various forms and locations.

It is my hope that this volume may help to inspire more self-expression to sustain and nourish the practice of model aeroplaning.

Bill Hannan
Escondido, California

GENERAL SUGGESTIONS

1. Read instructions thoroughly.
2. Study drawings and photos attentively.
3. Select tools and materials carefully.
4. Work safely (see page 5).
5. Use good lighting conditions.
6. Build lightly and neatly.
7. Take your time.
8. Review instructions before testing.
9. Test cautiously.
10. Fly safely (see page 5).
11. Try your own modifications.
12. And ultimately, design your own!



"Well, after you've seen hundreds of designs, you almost automatically have an 'eye' for the right proportions."

Tools of the Trade

Building model airplanes of the balsa wood variety requires relatively few tools; but the choice of tools can be important. We will divide our discussion into two parts: the first will deal briefly with those tools considered ESSENTIAL, while the second will be concerned with supplementary items, which, although not absolutely necessary, can assist in the construction of your models.

If I had to get by with only ONE tool, without a doubt it would be a single-edge razor blade. Single-edge razor blades are NOT all the same, incidentally. Some are too thin to be practical for cutting wood. Some of the "hollow ground" types fall into this group. They work well for trimming tissue, but their edges will nick and/or fold over if they are used for wood cutting. Probably you will have to try several brands before you find one that will best suit your needs. The price has very little bearing on the suitability of the blades. Locally, we are able to obtain "Industrial" razor blades at low cost through paint and discount stores.

Use only brand-new blades when cutting balsa. If they are used with a slicing motion, longer blade life and cleaner cuts will result.

The next most important tool, to my way of thinking, is the modeling knife. The advantage of this sort of knife is primarily in the choice of blade shapes which are available. For example, thin-pointed blades are useful when cutting curved parts from sheet balsa. By comparison, it is difficult to cut tight curves successfully with a razor blade. Also, a certain amount of whittling or carving is required in model building, and a modeling knife is well suited to the task. Several brands are on the market and it is well to examine them all. Look for one which holds the blade securely, yet permits easy removal when a replacement is needed.

While we are on the subject of cutting tools, we must remind you that anything capable of cutting wood is equally capable of cutting skin. When using ANY tools, exercise extreme caution at all times. Common sense safety precautions are a "must" if you are to enjoy your hobby without being hurt.

Since most models contain at least a few wire parts, a pair of needle-nose pliers and some sort of wire cutters (such as diagonals) are important additions to your tool supply. A little extra money spent on quality will be well rewarded here, as in the case of most tools.

Scissors are useful for cutting out patterns, tissue paper, etc. Any common household type is suitable, providing the

scissors are sharp and in good condition. If you are buying a new pair especially for modeling purposes, the barber type is suggested.

Razor saws are useful for making clean cuts in the larger sizes of balsa, and also in harder woods. Coping saws are helpful in making curved cuts.

A few small drills are desirable, and a pin vise or hand drill can be employed to turn them. Inexpensive carbon drills will serve in most cases.

For marking on wood, we have found fine-tip marking pens ideal. Very soft lead pencils or ballpoint pens will also do the job.

A ruler with a metal edge, or a machinist's scale greatly eases the task of making straight cuts, in addition to serving its intended purpose of measuring.

Brushes come in all sizes and price ranges. The cheapest ones are annoying since they usually shed their hairs at the most inopportune times. The quality of the brushes can affect the quality of the finish on your model too. So be prepared to invest in good brushes, which if properly cleaned, will last for years.

Sandpaper is a vital aid to modeling. Often the chief difference between an exceptional model and a "so-so" one can be traced directly to the proper application of sandpaper. It is an inexpensive product and is available in a great many forms. Its usefulness can be extended by fastening it to various blocks of wood to form sanding blocks. My personal choice in grades are No. 120, 220, 400, and 600, but try the various varieties yourself to discover the type best suited to your needs. Fingernail emery boards are another inexpensive form of sanding tool, which can be obtained in any department or drug store.

Common straight pins are particularly handy in model building, and are available in different sizes and types. They have a way of disappearing with use, so buy a few extra!

Probably 98% of most models COULD be constructed using only the basic tools mentioned above. There are, however, many other items which will make model construction easier and faster. Among the simpler ones are:

Files	Bench Vise
Razor Planes	Round-nose Pliers
Tweezers	Soldering Iron

Power tools are outside the scope of this discussion. Some "hobbyists" have facilities that closely resemble industrial machine shops. Yet, the fact remains that anyone willing to master the simple tools we have described, can produce satisfying models with a minimal investment. ■

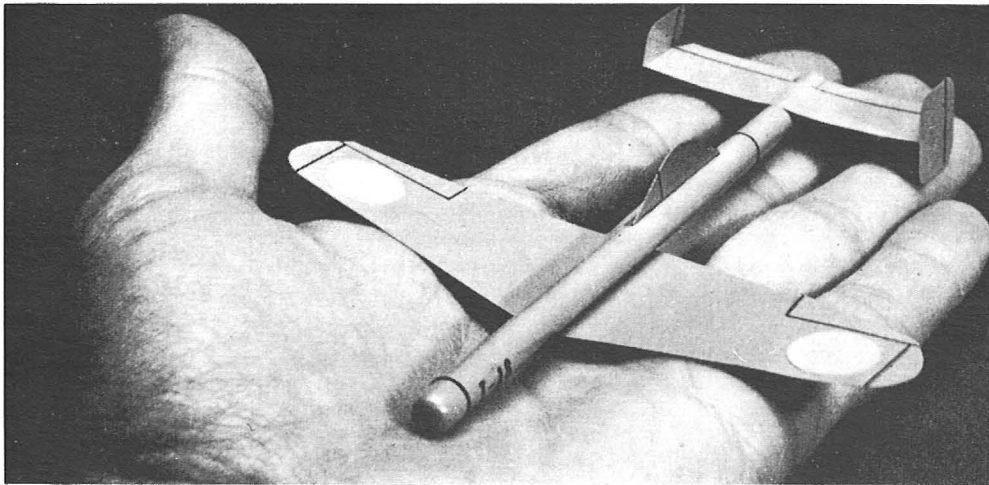
SAFETY

CAUTION: Safety should be a foremost consideration in all aviation, including models. Most safety habits are based upon good common sense, both in the construction phases and in actual flying.

The very nature of do-it-yourself type hobbies involves the use of potentially hazardous tools and chemicals, and it is vital to be aware of possible dangers. Any cutting instrument has the potential of cutting human skin as well as other materials, so alert use and logical precautions are a "must." It doesn't take much of a wound to remove the fun from a building session. Please be careful!

Store all sharp blades in a safe place out of children's reach. Read all tool manufacturers' directions and heed their warnings. The same holds true for glue and paint products, which must be used with adequate ventilation and care as prescribed by each manufacturer. Remember, if you can smell it, it may be hazardous! Safety glasses should be worn when there may be potential danger to your eyes.

When flying model aircraft, exercise special cautions to protect yourself and spectators from harm. For specific safety suggestions, consult the Academy of Model Aeronautics, 1810 Samuel Morse Drive, Reston, VA 22090, U.S.A. ■



Soda Jet-the Last Straw!

Ever blow the cover off a soda straw? Why not use two straws with wings on one and catapult it off the other?

WHEN Editor Ed Sweeney suggested that we experiment with lung-powered models, we were a bit dubious but, after constructing a few, it became evident that he had a winning idea!

These little models are a snap to build, and certainly must be the lowest-cost flying models this side of folded paper gliders. Soda straws are manufactured in several sizes, of both plastic and paper. We found the plastic variety to be much more rugged, and the difference in weight does not seem to matter. If you can obtain two different sizes of straw, the smaller ones can be used as launchers. Or, aluminum tubing from a hobby store can be used for the launcher.

Although it would be possible to cut the wing and tail parts directly from the drawings, it is suggested that you trace them and transfer the shapes to stiffer paper. The various markings can be colored with felt pens or colored pencils or, if preferred, cut from paper and glued on the finished model. Our models were assembled with contact cement, since some glues of other types

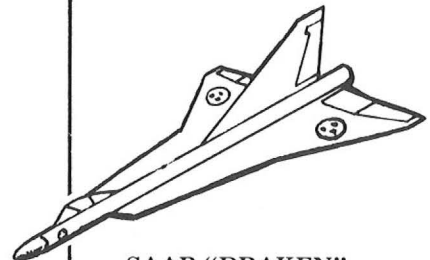
do not work well with plastic. If you decide to paint your aircraft, plastic model paint such as enamel should be used rather than dope.

The nose plugs can be carved and sanded from balsa wood and should be a snug fit into the straws. On some models, the plug will weigh enough to function as nose ballast, but on others it may be necessary to add a bit of modeling clay. This can be placed inside the straw behind the nose plug.

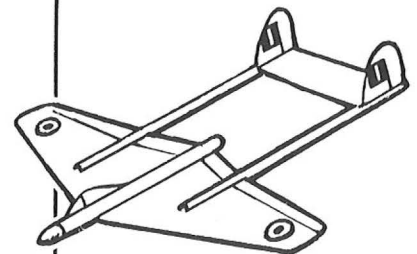
Hand glide the models until they have been adjusted. Slight upward bending of the elevators will probably be required in addition to the addition or subtraction of nose weight. Next, try launching the models with the "blow-pipe." Our best results were obtained by starting the aircraft off in a left-hand bank. Turns can be obtained by bending the rudders, and deflection of the ailerons can produce snap rolls!

After trying a couple of ours, why not try designing a few of your own? Be the "straw boss" of your own air force! ■

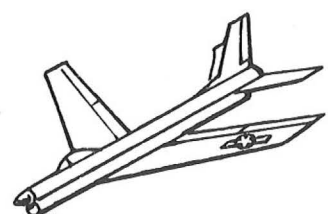
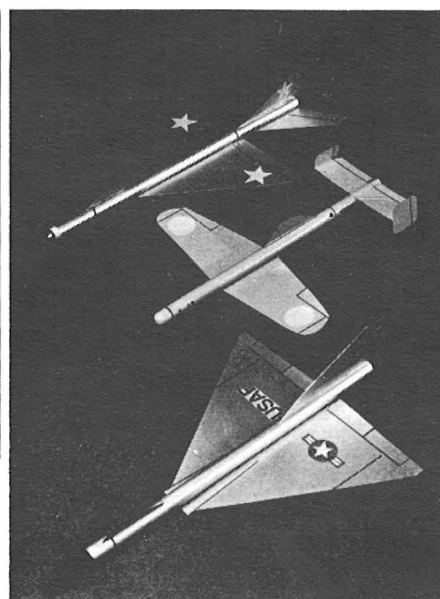
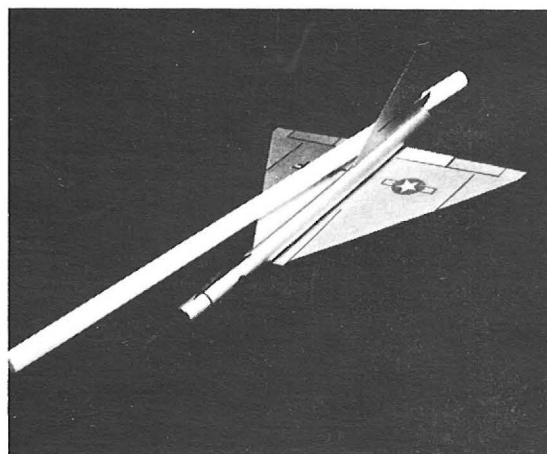
THOUGHT STARTERS



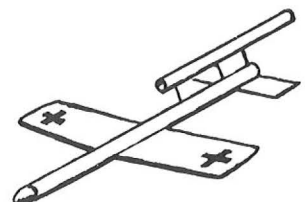
SAAB "DRAKEN"



DE HAVILLAND "VAMPIRE"



SABRE "D"
(two straws)



V-1 "BUZZ BOMB"

After assembling, give one light spray-coat of enamel paint. Detail with ball-point pen. Shown are models made from plans, but you can design your own air force of semi-scale planes.

FULL SIZE DRAWINGS

SODA-JETS

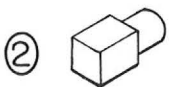
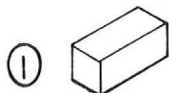
BY BILL HANNAN

COLOR: GREEN
INSIGNIA: RED

1/4"
FRONT VIEW
SHOWING
DIHEDRAL
(BAKA BOMB ONLY)

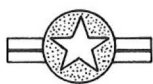
I-18

WING POSITION



TYPICAL NOSE PLUG
CONSTRUCTION

COLOR:
SILVER
INSIGNIA:
BLUE
WITH
RED
BAR



USAF

BEND BOTH SIDES
SLIGHTLY TOWARD
TOP OF MODEL.

CONVAIR
"DELTA DART" (REALLY!)
U.S.A.

BEND UP
SLIGHTLY

TYPICAL
ASSEMBLY

BOTTOM VIEW

"BAKA BOMB"
JAPAN, WWII

FOLD TAB
AND GLUE
IN PLACE

FOLD TABS

MAKE
TWO

POSITION OF STABILIZER

ALL FUSELAGES ARE MADE
FROM PLASTIC SODA STRAWS.
WINGS, TAILS, AND CANOPIES
ARE STIFF PAPER.
NOSE PLUGS ARE Balsa

SUKHOI
"FISHPOT"
U.S.S.R.

COLOR:
SILVER
INSIGNIA AND
NOSE: RED

5512

CAUTION: DO NOT
AIM AT ANYONE!

HERE'S A LITTLE two-winger which is both easy and inexpensive to construct. The fuselage, propeller assembly and landing gear are from a North Pacific "Sleek Streak," and a few items from your scrap box should complete the project.

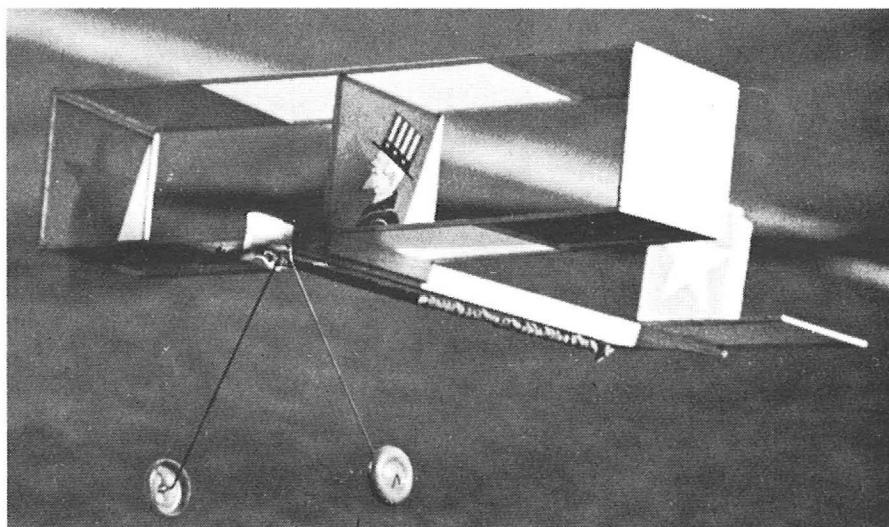
The model is somewhat unusual in that it employs absolutely no dihedral. Instead, lateral stability is assured by the vertical curtain surfaces separating the wings. A glider, by Frank Scott/Jiri Kalina, featuring this system appeared in the February *Model Aviation*. (1976)

But the idea originated early in aviation history, having been advocated by Australian Lawrence Hargrave, inventor of the box kite, during 1893. Credit is also due F. W. Lanchester, of England, who flew model gliders with vertical stabilizing vanes during the early 1900's. The first constructor to apply the concept to full-size aircraft appears to have been Gabriel Voisin, during 1905. Santos-Dumont, who also employed wing curtains (six of 'em!), hedged his bets by using dihedral too. Other early experimenters who tried the idea include Louis Blériot and Henri Farman.

Interestingly, many pioneer model "aeroplanes" flew without dihedral or vertical curtains either, but the majority seem to have been gliders or contrarotating propeller-driven twin-pushers, which are not subject to the de-stabilizing effects of a single propeller. Then, too, a number of successful free-flight scale models were flown without dihedral, but most "cheated" a bit, using wing-tip washout or pendulum controls. A few years ago, Walt Mooney published a series of models which revived the vertical curtain theory, but in a new form, using oversize profile pilot caricatures for lateral stabilization.

Dihedral joints have always been a source of difficulty to beginning builders,

Borrowing from the early days of flight, this R.O.G. uses interplane 'curtains' instead of dihedral.



With its Sleek Streak prop spinning madly, the distinctive Boxy Bipe flits by the camera after a takeoff. A triplane version flies well.

Bill Hannan

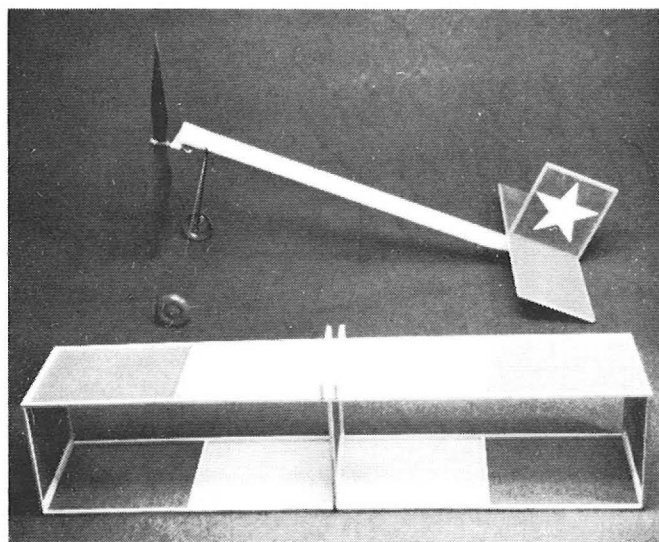
Boxy Bipe

and are often failure-prone in case of a crash. So here's your chance to try this well-proven, but seldom seen alternative, and have some fun in the process!

First, purchase a North Pacific Sleek Streak ready-to-fly model. You may as well fly the Streak for a while, as the parts needed for this model are not apt to be damaged in the process.

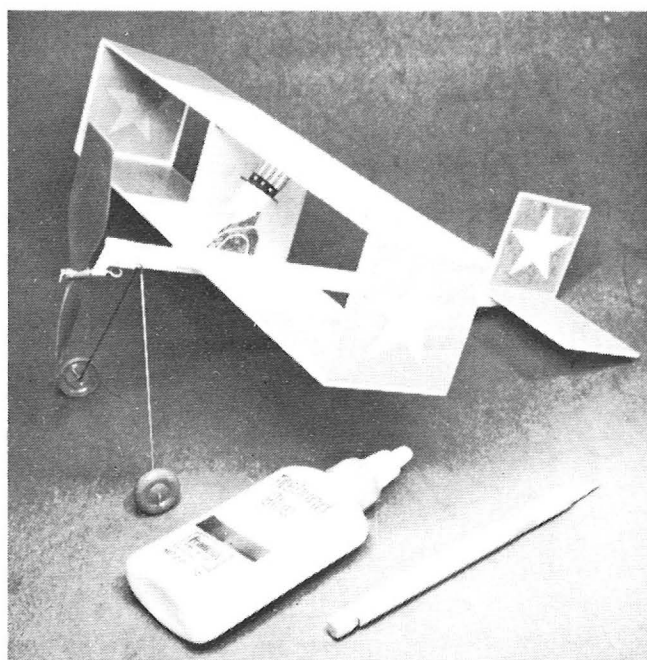
Other materials required include: Several 1/16" sq. balsa strips, lightweight colored tissue paper, a small section of 1/16" sheet balsa (Note: it would be possible to laminate 1/16" sq. strips for the purpose), your choice of glue, plastic wrap.

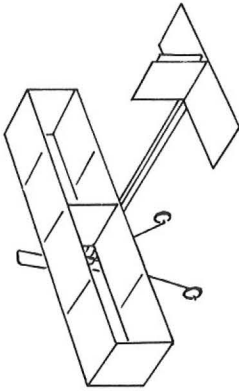
Tools suggested include: Single-edge razor blade, sharp modeling knife with pointed blade, scissors, common pins.



Color tissue covering is not doped or water shrunk. Guide strips allow wing movement for balance—Scotch tape as shown on plan.

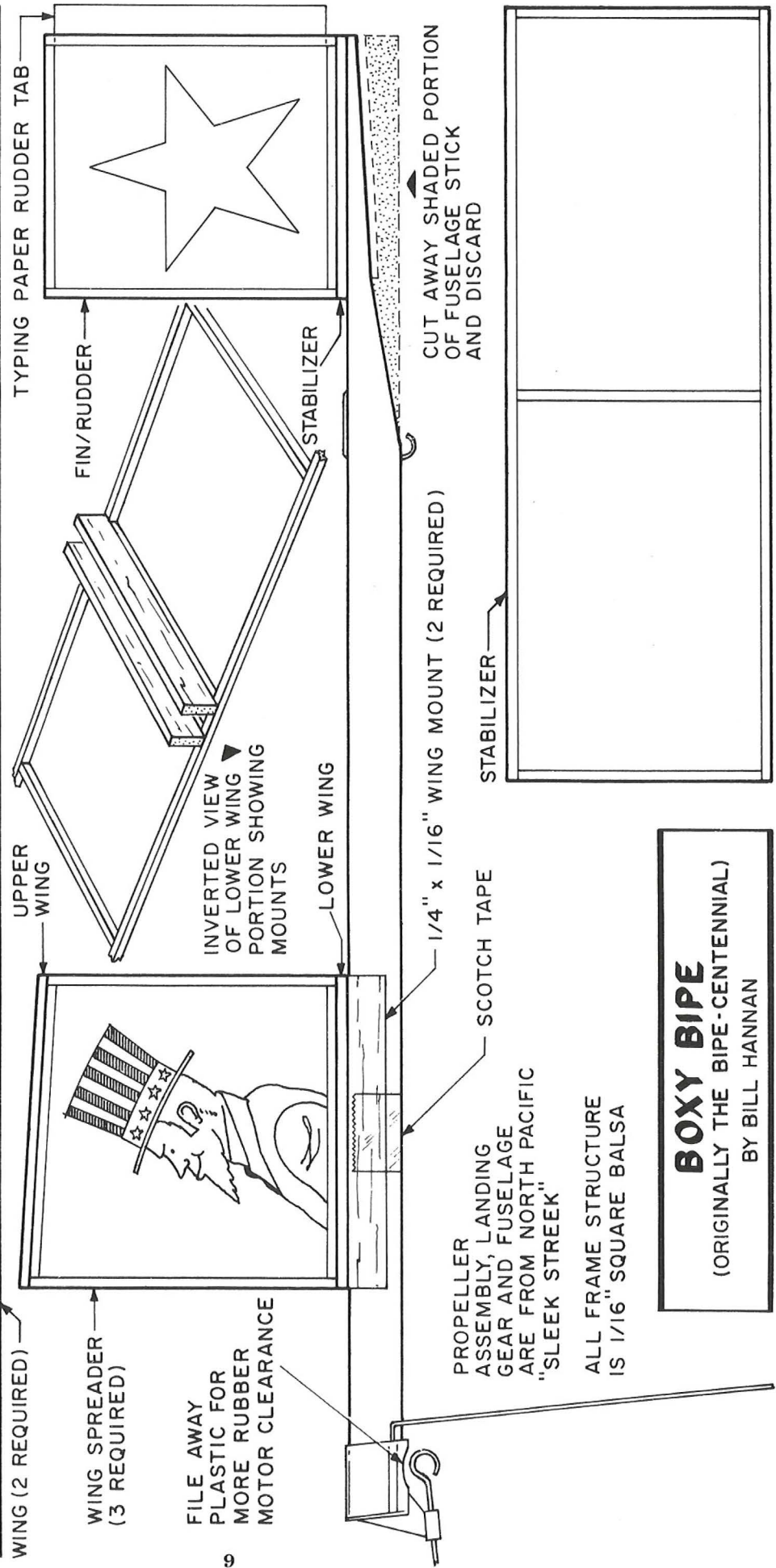
Glue or cement and a balsa knife or single-edge razor blade the only tools.





NOTE: WINGS ARE FLAT,
WITHOUT DIHEDRAL !
COVER TOP SURFACES
ONLY, WITH LIGHT TISSUE.
DO NOT SHRINK.

UPPER AND LOWER WINGS
ARE SIMILAR
EXCEPT
OUTER PIECES SHOWN
IN DASHED LINES
REQUIRED FOR LOWER
WING ONLY



PROPELLER
ASSEMBLY, LANDING
GEAR AND FUSELAGE
ARE FROM NORTH PACIFIC
"SLEEK STREEK"
ALL FRAME STRUCTURE
IS 1/16" SQUARE BALSA

BOXY BIPE
(ORIGINALLY THE BIPE-CENTENNIAL)
BY BILL HANNAN

Construction

A soft building surface, such as insulation board, into which pins may be easily pushed, is recommended. Cover the full-size plan with plastic wrap to protect it from glue.

Wings: Construct the wings from 1/16" sq. balsa strips. By cutting the longest pieces first, waste will be reduced. Note that the upper and lower wings are almost, but not quite, alike. The lower wing has two extra members in the center section, which are shown on the plan in dotted lines. Secure all strips with straight pins while they are drying. "X" the pins over the strips, rather than piercing the strips, which might weaken them. Allow the glued joints to dry completely, before removing the wings from the building board.

Tailplanes, and Wing Spreaders: The stabilizer, rudder and wing spreaders are constructed in the same manner as the wings. Try to make the three wing spreaders as nearly alike as possible.

Fuselage: The only modification to the Sleek Streak fuselage consists of cutting a portion from the rear, as indicated on the plan. This is not an essential operation, but serves to lighten the tail end for increased efficiency.

Covering: Only the tops of the wings and stabilizer are covered with tissue, and only one side each of the rudder and wing spreaders. Note the *outer* sides of the tip wing spreaders should be covered for best appearance. Flight performance will not suffer if you goof, however. The tissue may be applied with clear dope as an adhesive, but perhaps it is easier to employ white glue which has been slightly thinned with water, applied with a pointed brush. Do not use excessive amounts, or wood warping may occur. When the tissue adhesive has dried, trim off any excess, using a sharp razor blade. Do not water-shrink or dope the tissue, which could easily generate warps.

Colors: Although any color tissue could be used, we chose red, white and blue. The white stars and "Uncle Sam" were cut from ordinary white typing paper, with a

pointed modeling knife, and glued in position.

Assembly: Cement the stabilizer onto the top rear of the fuselage, being careful it is properly square as viewed from both the rear and top. Next, add the rudder, lining it up accurately in the center of the stabilizer, then the trim tab.

Pin or weight the lower wing flat on the building board, and glue on the wing spreaders, one at a time, with the tallest edges to the front of the wing, since they determine the incidence. Prop the spreaders to a vertical position while drying, using sugar cubes, dice, or something similar.

Add the top wing, adjusting the spreaders as needed to line up properly. Work carefully to assure precise alignment. When the complete wing assembly, called a cellule, is dry, turn it upside down, and glue on the wing mount members, which have been cut from 1/16" sheet. These should be spaced for a snug fit on either side of the fuselage. If too tight, use a folded piece of coarse sandpaper on the inner sides. If too loose, glue a strip of typing paper on the inner side of one mount. The wing is not glued on, but may be secured with a strip of scotch tape until its proper position has been determined.

Flying: Try for a windless day, and if possible, test-fly over grass or weeds just in case. Glide the model a few times from shoulder height. If it dives, slide the wing cellule forward slightly. If it stalls, slide the assembly aft. Next, try a few turns of the propeller, launch gently (do not throw). Watch the flight path carefully, reshifting the wing cellule if required to achieve a smooth descent.

Increase number of hand winds, and repeat. If model turns excessively to one side, counter it by bending the paper rudder tab opposite the turn. In extreme cases, a tiny amount of clay ballast may need to be added to the wing tip opposite the direction of turn. Gradually increase the number of propeller winds until the model can safely handle a full row of knots or more. A rather peculiar skidding action of

the model right after launch is characteristic of the stabilizing system, and is no cause for concern.

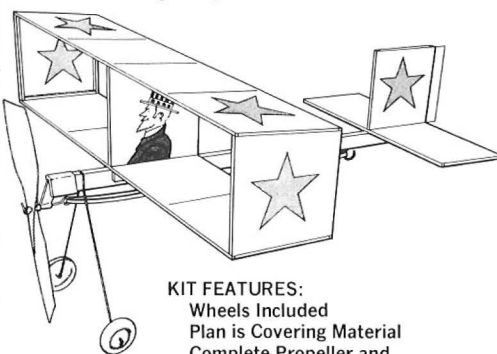
Up to this point, the standard North Pacific "gum band" has been employed. This can be replaced with a longer, lubed rubber motor for greater endurance. However, a longer motor may have a tendency to bunch up on the propeller hook, creating a prop-stopping bind. By carefully filing away more clearance in the plastic propeller support bearing, as shown on the drawing, the problem can be reduced. Experiment with different motor sizes and loop lengths. We use 2-mm size for slow flights, and 1/8" for snappier ROG starts and better climb.

Postlude: Since our model was constructed, several different versions have been built by Russ Barrera and Warren Shipp (who came up with a triplane) and all have exhibited similar stable flight characteristics.

And, according to a newspaper clipping sent to me by my mother, both Boeing and Douglas engineers are giving serious consideration to vertical tips, which they call "winglets." Truly, history repeats itself!

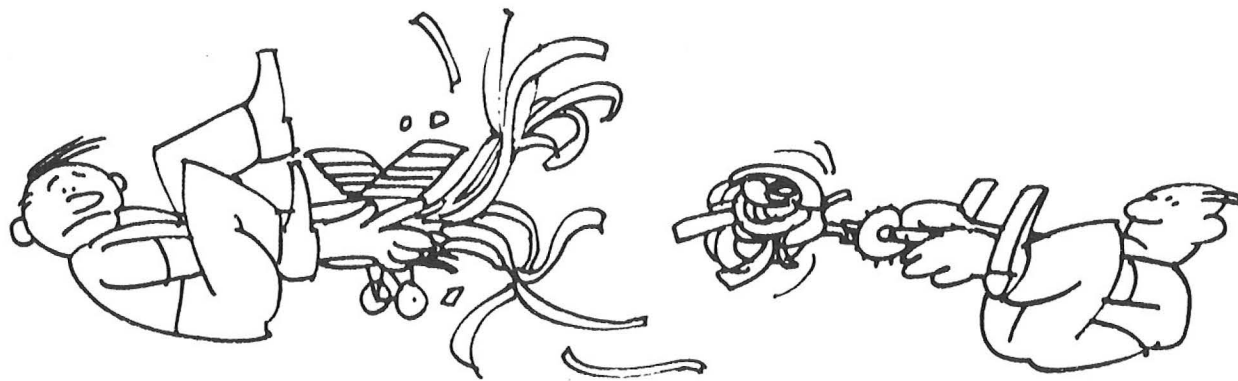
SIG UNCLE SAM

Designed by BILL HANNAN

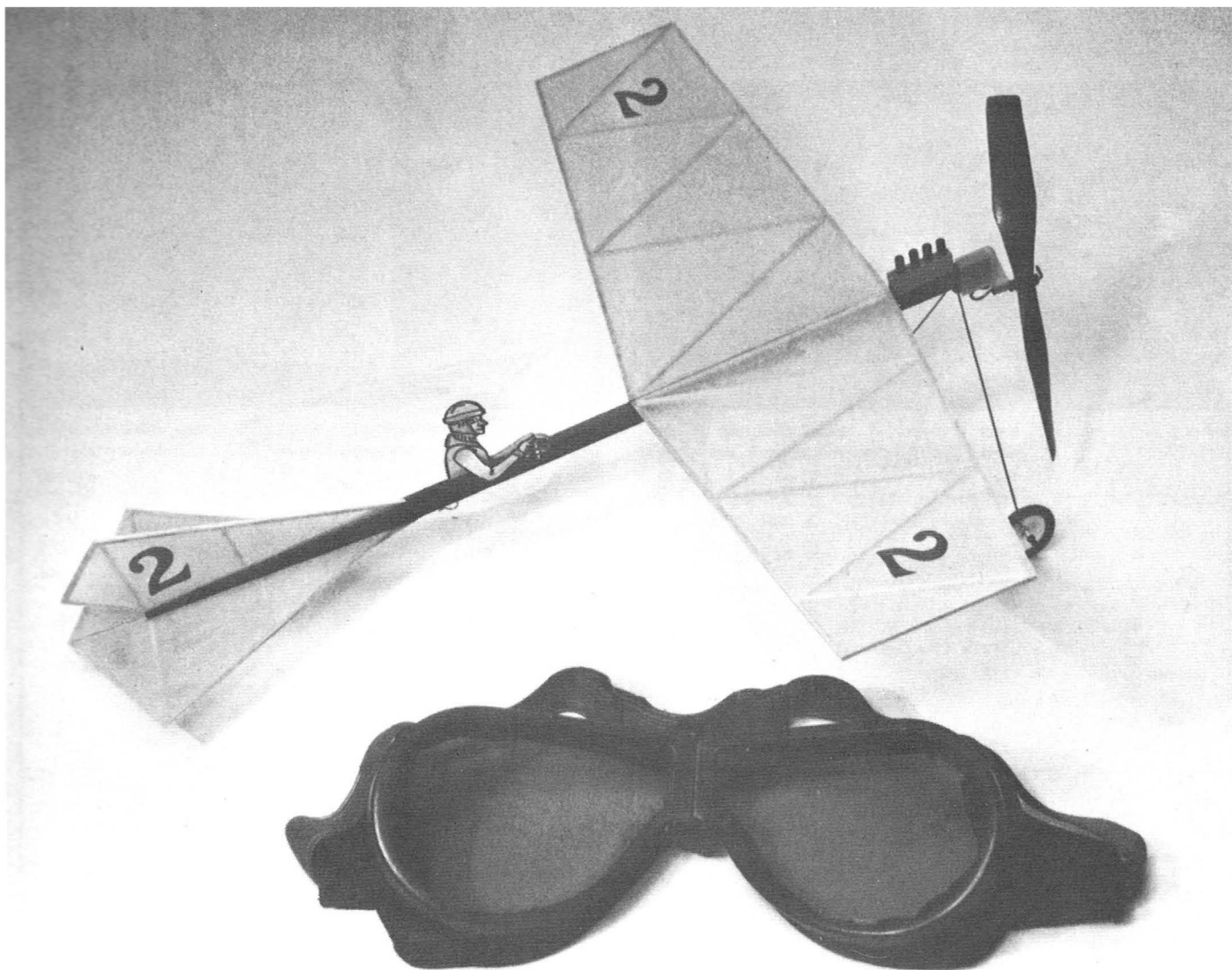


KIT FEATURES:
Wheels Included
Plan is Covering Material
Complete Propeller and
Nose Piece Assembly

Kitted by Sig Mfg. Co. as "Uncle Sam"
and by AKUS of Sweden as "Tre Kronor."



Bill Noonan



AM/FM

by Bill Hannan

This rubber powered ROG has the flavor of a French Antoinette. It flies fine.

Remember the movie "Those Magnificent Men in Their Flying Machines"? My favorite scene was the graceful Antoinette gently landing on the narrow English country road, to the astonishment of an elderly couple in their vintage auto. The motion picture aircraft was based upon the classic French pioneer Antoinettes of the 1909 era, which were very advanced for their time, particularly when compared with the biplanes against which they competed.

Although our little AM/FM is quite basic, we have tried to incorporate some of the "flavor" of the Antoinette. It does require more effort in construction than the usual r.o.g. because of its angle-cut joints, but offers more visual interest in exchange.

The plastic propeller and its bearing are from a North Pacific "Skeeter" ready-to-fly

model and may be used "as is." However, by replacing the propeller shaft and adding some brass or teflon thrust washers, efficiency may be improved.

Materials required include: Several $\frac{1}{20}$ " square balsa strips, $\frac{1}{4}$ " \times $\frac{1}{8}$ " balsa strip, lightweight covering tissue, .025 diameter music wire, and $\frac{3}{4}$ " diameter plastic wheels. (Note: $\frac{1}{20}$ " square strips are commonly used for Peanut Scale models, but may not be found at some hobby shops. In such a case they may be ordered by mail from Peck-Polymers, P.O. Box 2498, La Mesa, California 92041.

Firm lightweight $\frac{1}{16}$ " square balsa strips may be employed instead if desired.

Suggested tools include: single-edge razor blade, modeling knife with pointed blade, sandpaper block or stick and straight pins.

Building may be done on a flat, soft surface

such as insulation board into which pins may be easily pushed.

Construction

Although you could build directly over the full-size plans, why not buy a photocopy of the page? Cover the plan with transparent kitchen wrap to prevent glue from adhering to it.

Wings

Construct the wing panels from firm straight balsa strips joined with your favorite glue. Cut the longest strips first to minimize waste. Try for concise, workmanlike joints which not only appear better but contribute greater strength. Secure all strips in position, while drying, with common straight pins "Xed" over the strips rather than piercing them which could cause weak spots. Allow glued joints to dry thoroughly before removing panels from the building board.

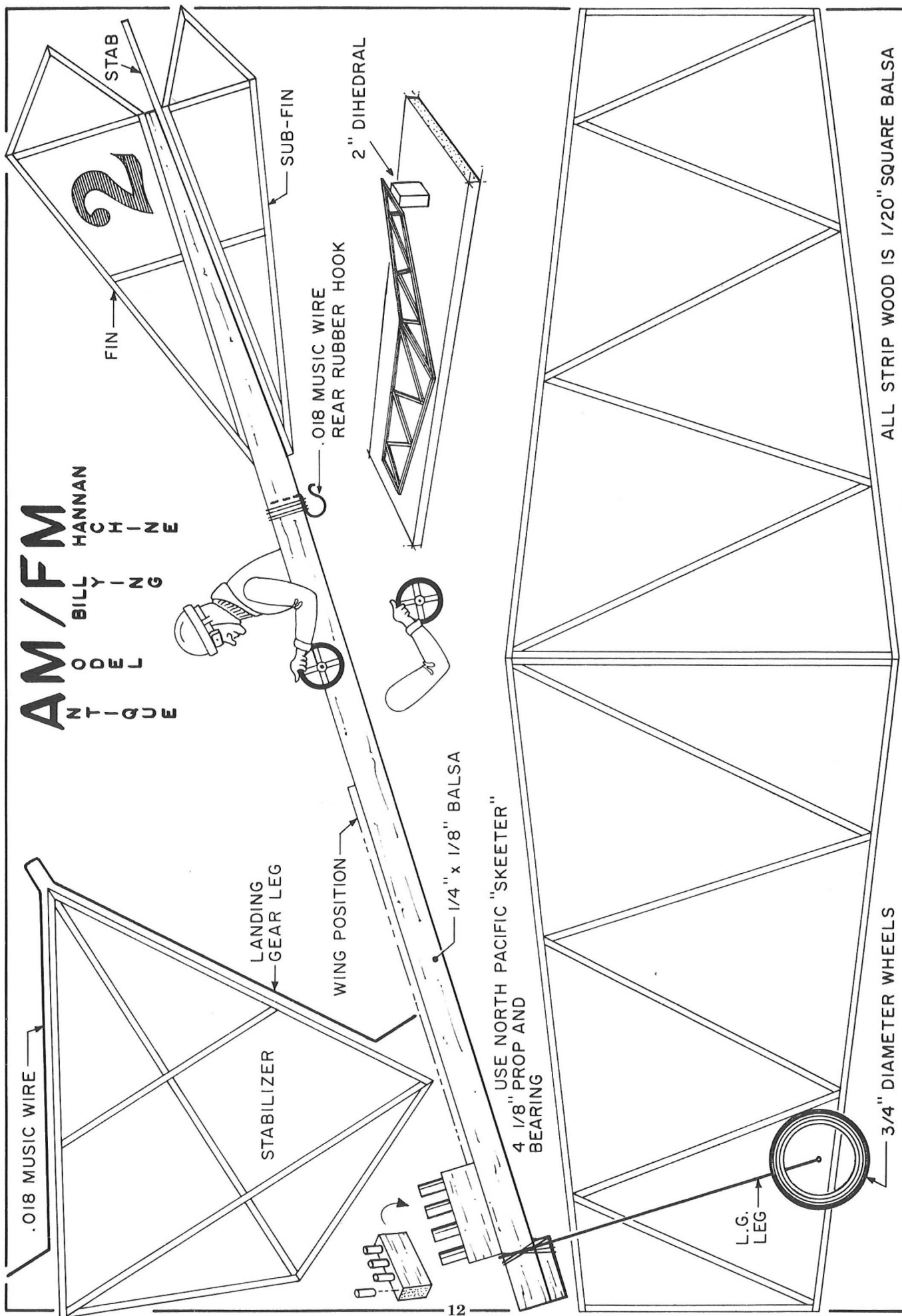
Tailplanes

These are constructed in the same manner as the wings, but possibly with somewhat lighter wood, if available.

Fuselage

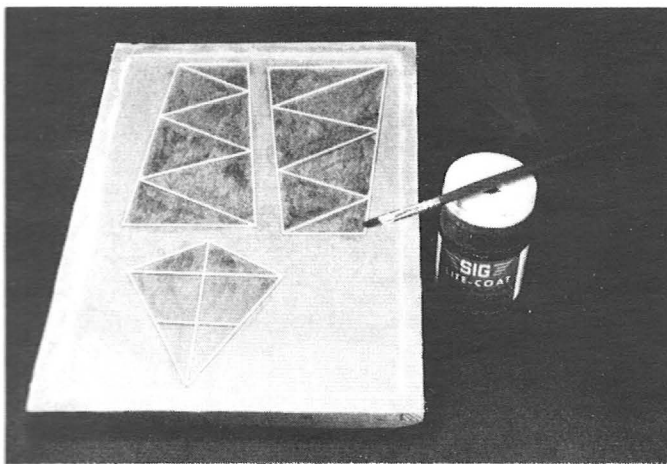
Cut the fuselage to shape from a firm, straight $\frac{1}{4}$ " \times $\frac{1}{8}$ " balsa strip. Note that the

AM/FM **ANTIQUE** **MODEL** **BUILDING** **HANNAH** **CHINE**

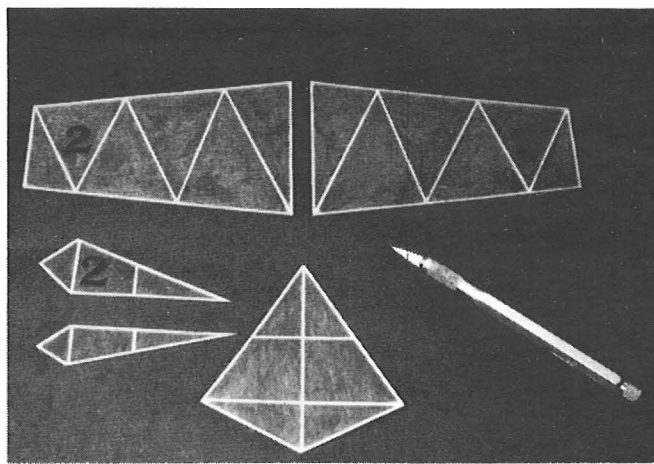


ALL STRIP WOOD IS 1/20" SQUARE BALSA

3/4" DIAMETER WHEELS



Tissue is glued to wooden frame and shrunk with water (above). Parts are then doped to tissue. Process minimizes warps. Ultra-light.



Covered components ready for assembly (above). The AM/FM takes to the air (bottom). Simple construction, Plane looks scale.

angle at the rear determines the stabilizer incidence. A short section of the $\frac{1}{4}'' \times \frac{1}{8}''$ stock is cemented to the top front of the fuselage to form part of the dummy engine. Another portion of the same stock is cut-down and glued beneath the nose to serve as a spacer for the plastic propeller bearing, which should be a snug fit.

The rear motor hook is bent from thin music wire, inserted into the fuselage underside as shown, and secured with glue and thread binding.

Covering

Thin flat surfaces are prone to warping which, if severe, can cause flying difficulties. Therefore, every effort should be made to minimize them, and several approaches are possible. If the model is to be flown indoors or in mild outdoor climates, the tissue may be applied, left unshrunk and undoped. But if your model will be flown mostly outside and be subject to changes in temperature and humidity, consider a shrunk and clear-doped covering job. One method of doing this involves a simple covering aid. This can be an actual picture frame or one assembled from $\frac{1}{2}''$ square wooden strips. Tissue is applied to the frame with thinned white glue, allowed to dry, then water shrunk. Next, the model parts are attached to the tissue while it is still on the frame. A thinned coat of non-shrinking clear dope such as Sig Lite-Coat may then be applied and allowed to dry thoroughly... the longer the better.

A sharp blade may then be used to trim the model parts from the tissue-covered picture frame. Note that recent experiments conducted by Warren Shipp of the San Diego Scale Staffel club suggest that performance may be enhanced by covering wings on the bottom rather than the top. However, we stayed with the traditional fashion for better looks!

Prop up one wing tip as shown for dihedral and join the two panels.

Landing gear

Bend the landing gear legs to shape from music wire. Any wheels of approximately $\frac{3}{4}''$ diameter are suitable, but we used transparent wheels marketed by Peck-Polymers which give the visual effect of spoked wheels. Or, for truly elite appearance, consider Fulton Hungerford's genuine spoked wheels. Our transparent plastic wheels were a loose

fit on the axles, so small diameter tubing or eyelets served as bushings. Wheels may be retained by bending the axle ends, gluing on short lengths of wire insulation tubing, or simply with tiny globs of 5-minute epoxy.

Decor

Although the AM/FM could be built and flown without decorations, the small extra time investment involved can add greatly to the model's charm. Our wings and tail surfaces were covered with yellow tissue which makes a pleasing contrast to the fuselage, which was merely colored with a brown felt pen. Wing and tail numbers may be drawn on with a marking pen or cut from colored tissue and doped in position.

The dummy engine cylinders may be cut from a small dowel, balsa sanded round, or plastic rod or tubing. Incidentally, some of the original French Antoinettes employed V-8 engines rather than the 4-banger used on the "Mag Men" movie aircraft, so build the type you prefer! Paint as desired for greater realism.

The paper "hero pilot" may be brightened with color pencils or fine-tip fibre pens.

Assembly

Install the wing and tailplanes checking alignment carefully from both the top and rear. Secure the landing gear assembly to the fuselage with glue and thread binding.

Assemble and glue the paper pilot to the fuselage with one hand-wheel on each side.

Recheck wings for warps. If necessary, steam from a tea kettle may be used to correct them. However, if they are minor it is

sometimes possible to "overpower" their effect with other adjustments.

Flying

Install a short loop of $\frac{1}{16}''$ rubber for initial tests. With rubber in position the model should balance in a level attitude when supported by its wing-tips about $\frac{1}{2}''$ back of the leading edges. Individual models may vary in balance because of variations in material weights. For example, solid plastic wheels weigh considerably more than Hungerford spoked wheels. The balance may be corrected by adding clay ballast fore or aft as required. In drastic cases of tail heaviness, the wing may be removed and remounted more rearward. For minor balance changes the landing gear legs may be bent forward or aft to suit.

Add a drop of oil to the propeller bearing to reduce friction. Test glide the model in a windless location. A soft landing area is desirable too but one must not be greedy, so given an either/or choice we'll take the windless location! If the model stalls, increase nose weight or bend landing gear forward. If it dives, add weight to the tail end or bend landing gear slightly aft. Repeat the tests with a few hand-winds of the propeller and watch the flight path carefully. If the model turns too tightly, try adding a bit of clay ballast to the wing-tip opposite the offending turn. Gradually increase the number of windings and readjust if necessary.

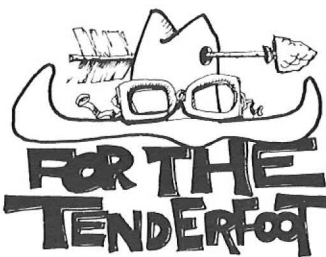
Replace the rubber motor with a longer, lubed loop (which may bring about the need for rebalancing) and use a mechanical winder for increased performance and duration.

I hope Bill Hannan was right when he told me that the AM/FM would "turn her on!"

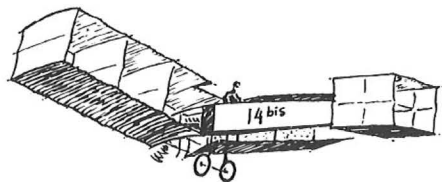
Art: John Downer
Caption: Earl VanGorder



Tail First



KENNETH AND WILLIAM HANNAN



1906 SANTOS-DUMONT

DON'T feel backward about building this "wrong-way" flyer, because some of aviation's most important pioneers started off in this direction. For example, many of the Wright Brothers' machines featured forward-mounted "tails," as did Santos Dumont's Bis 14 (one of the first heavier-than-aircraft to fly in Europe). Even the famous channel-cropper, Louis Blériot, built at least three canards, as tail-first aircraft are called.

The North American Aviation XB-70 Valkyrie is one of the more recent examples of the type. Incidentally, the forward surface on a canard is usually referred to as a "leading plane," rather than a tail, which after all is supposed to be on the south end of any north-bound animal!

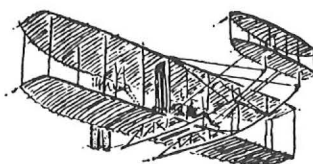
Much of the design effort and test-flying of our model was carried out by Tenderfoot Kenneth Hannan, who first became interested in canards while watching one being flown indoors by Walt Mooney, of San Diego, Calif.

Construction: First, take a good look at our plans and illustrations to be sure you understand how the various parts fit together. The model will perform best if it is light, so carefully select your balsa wood. Sight down each piece to be certain that

it is straight. Heft several pieces of wood, to tell which is the lightest.

Obtain a piece of Celotex, soft wood board, or even a flat sheet of corrugated cardboard, on which to build the wings and leading plane panels. We suggest you start with these parts so that they will have plenty of time to dry while you are working on other items. Since the plans are printed full size in the magazine, you can work directly over them. To protect the plans from glue, cover them with Saran-Wrap or waxed paper.

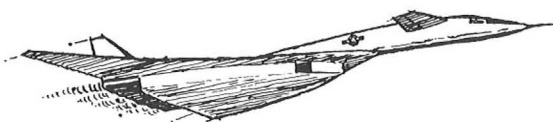
Wing: Select straight $\frac{1}{16}$ "-sq. balsa strips, and cut the two longest ones first. Pin



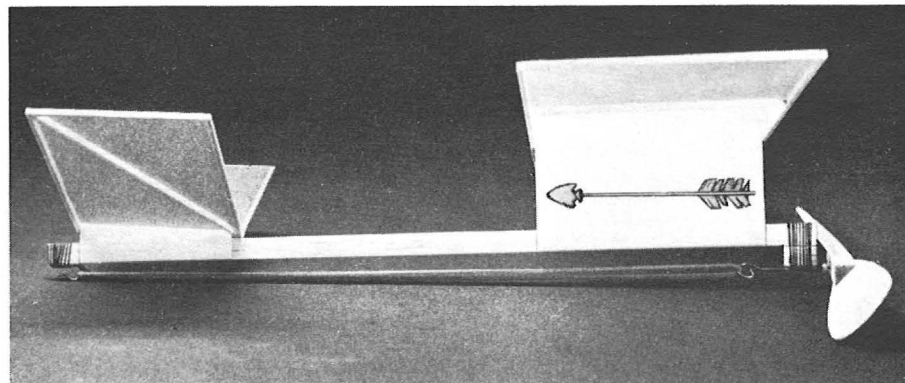
1908 WRIGHT

them in place over the plans so that they will be held flat while drying. Do not pierce the wood with the pins, but instead, put pins on each side at a slight angle, so that the wood will not be weakened.

Next, add the shorter pieces of $\frac{1}{16}$ " sq. strip which serve as ribs. Note that there are two of them glued together in the center of the wing. If you measure the length of the first rib accurately, you will be able to use it as a guide in cutting the remaining five pieces. Try to avoid getting too much glue on the joints; this looks messy,



NORTH AMERICAN XB-70



1911 BLÉRIOT

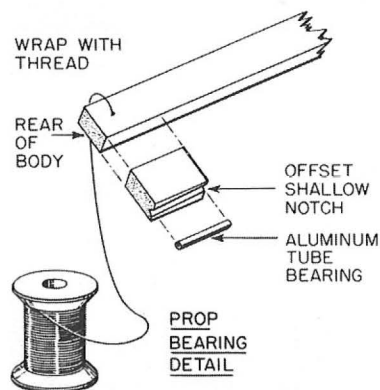
and adds unnecessary weight.

Leading plane: This is constructed in two parts, from $\frac{1}{16}$ " sq. balsa strips, which are pinned down to the plans in the same manner as the wing. Take your time to fit the diagonal sticks well, rather than trying to force them into place, or expecting the glue to fill in any cracks left by pieces that are too short. Patience here will pay off in a stronger and neater appearing job.

After the two leading plane panels are thoroughly dry, remove them from the building board. Using a sandpaper block, bevel the two ends as shown on the drawings. Sand with a gentle pressure so that the structure will not be damaged. Next, apply glue to both beveled edges, place the parts on waxed paper, and elevate one edge 2", to achieve the correct dihedral (up-tilt) angle. It is important that this joint be allowed plenty of drying time.

Fuselage: Choose a light but stiff piece of $\frac{1}{8} \times \frac{1}{4}$ " balsa strip, and cut it 9" long. Another piece of the same stock is cut $\frac{3}{8}$ " long to serve as the bearing block. Cut a shallow notch in one face as shown on the drawing. This angled notch offsets the thrust line, and locates the prop-shaft bearing, which is cut from aluminum tubing.

Roll the tube back and forth under a sharp blade to score a groove around it. Then snap it apart, and use sandpaper to smooth the end. Roughen up the outside of the tubing with a knife or sandpaper, so that glue will be better able to adhere. Glue the bearing block onto the fuselage, add the tube bearing, wrap the whole assembly with sewing thread, and apply a thin layer of glue over the thread.



Using needle-nose pliers, bend the wire hook for the nose to shape, and apply it to the fuselage with thread and glue binding. While you are bending wire, bend the propeller shaft to the shape shown.

Many great planes have flown backwards. So does this little rubber job.

1. STUDY THE PLAN.
2. MEASURE TWICE, CUT ONCE
3. CUT LONG PIECES FIRST.
4. TAKE YOUR TIME!

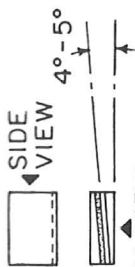
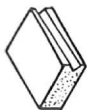
WING

POWER: ONE LOOP OF 1/16" OR ONE STRAND OF 1/8" FLAT RUBBER FOR INDOOR AND INITIAL OUTDOOR TESTING. EXPERIMENT FOR BEST RESULTS.

MAY BE SET UP TO FLY
IN RIGHT-HAND CIRCLES
IF PREFERRED.
...À CHAQUON SON GÔÙT"

USE BALSA FOR ALL
WOOD PARTS.

**3/8" x 1/4" x 1/8" BALSA
BEARING BLOCK**



BOTTOM VIEW
SHOWING OFFSET
NOTCH FOR PROP
SHAFT BEARING TUBE
(SEE ALSO PROP
BEARING DETAIL
DRAWING)

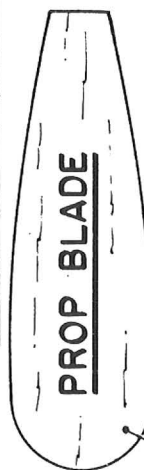
1/16" SQUARE

15

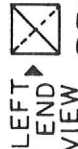
TAIL-FIRST TENDERFOOT

FULL SIZE PLANS

BY KEN & BILL HANNAN



1/32" SHEET
(MAKE TWO)



PROP HUB



MAKE HUB FROM
1/4" SQUARE OR
TWO PIECES OF
1/4" x 1/8" BALSA
LAMINATED.

1/32" SHEET -
(MAKE TWO)

FLY IT
THIS-A-WAY

PROP SHAFT BEARING
(1/16" DIAMETER
ALUMINUM TUBE)

BEARING BLOCK

BEADS

⚡ BEND AFTER
= PROP IS ON

.025-.045 DIAMETER
MUSIC WIRE PROP SH

WING MOUNT-

FUSELAGE

1/4" x 1/8"

.025-.045 DIAMETER
MUSIC WIRE HOOK

FRONT END
DETAIL

FRONT VIEW OF FINISHED
LEADING PLANE, SHOWING
DIHEDRAL ANGLE

LEADING PLANE MOUNT-

MAKE TWO)

THREAD BINDING-

Cut out the leading plane mounts and wing mounts from $\frac{1}{32}$ " balsa sheet. Make paper patterns of these items to be sure that they are the right size and shape. Mark their positions on the fuselage sides with a pencil, and glue the parts in place.

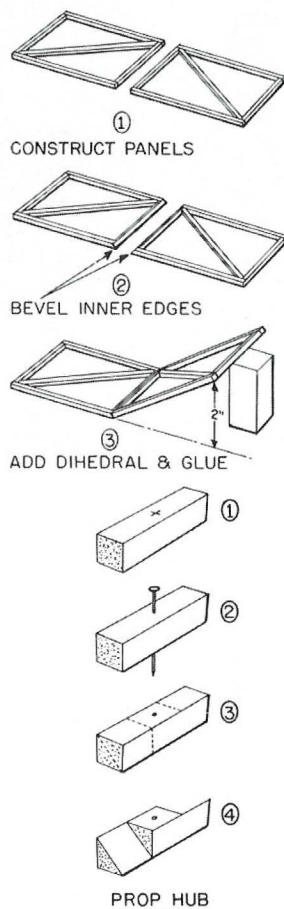
Propeller: This little prop is not difficult to make, but take your time for best results. The hub is made from two pieces of $\frac{1}{8} \times \frac{1}{4} \times 1$ " glued together, or if you happen to have a scrap of $\frac{1}{4}$ " sq. balsa strip, use that. The wood for the hub should be medium hard, not soft. Find the exact center and push a straight pin through it. This is easier said than done, and you may have to try it more than once to get the hole properly centered. It might help to push the pin halfway through from one side, then halfway through from the other, until the holes merge. The object, of course, is to achieve a true-running propeller that will not wobble.

Next, measure and mark the portions of the hub which will be cut away to receive the prop blades. A diagonal line drawn on each end of the hub will help establish the depth of each cut. And speaking of cutting, watch out for your fingers while working on such small pieces as this. Shaving away the wood a chip at a time is safer than trying to hack out the entire corners at once.

The two prop blades are cut from $\frac{1}{32}$ " sheet balsa. It is well to use a paper pattern as a guide for accuracy. Round the blade edges slightly with sandpaper. Glue the blades onto the hub, making every effort to center them properly. When the blades have dried, push a thin wire through the hole in the hub, and see if the prop balances. If one blade drops to the bottom, sand it to reduce its weight. Time spent on this operation will result in smoother flights.

Slide the propeller shaft through the bearing tube and add a couple of glass "seed beads" to serve as thrust bearings. Place the prop on the shaft and check that there is enough clearance between the blades and the end of the fuselage. It may be necessary to use an extra bead or two to provide the proper spacing. Using needle-nose pliers, bend the end of the prop shaft into a "U" and force it into the prop hub. Apply a film of cement over the area to keep the wire in position.

Covering and decor: Select the lightest grade of tissue that you can find for covering. Only the tops of the leading plane and wing are covered. The original was covered with red, white, and blue tissue, which is quite effective. The leading plane is red, and the wing is white with blue tip panels. Another interesting scheme would be all-white with red and blue "racing stripes." The small "Tenderfoot arrow" may be emblazoned on the side of the wing mount if desired.



Have your mother, sister, or girl friend iron out the tissue prior to using it to make it as smooth as possible, since it will not be water shrunk on the model. Allow the tissue to cool to room temperature before applying it. With care a tight job will result, since there are no curves involved.

We obtained good results using Sig "Lite-coat" as a tissue adhesive; it is heavily plasticized (prevents over-shrinking) and resists warping. It is also possible to use rubber cement to attach covering material, and you may wish to give it a try. By experimenting with different approaches to model building, you will soon discover the system that works best for you. Trim the excess tissue off with a sharp razor blade.

After the wing is covered apply glue to both sides of the center rib and insert it between the wing mounts. Press down until the wing mounts touch the underside of the wing's tissue covering.

The leading plane now may be glued in

place. Check that it is correctly aligned as viewed from both the front and side of the model. Add a drop of oil to the prop-shaft bearings and you are ready to go.

Flying: Since this model is small and light, it should be flown only under calm conditions. If you have access to a suitable indoor flying site, such as a gymnasium or hangar, so much the better. Indoors, or under dead calm conditions, the model may be flown with very low power. It is better to start with too little power rather than too much, at least until an understanding of the model's flight characteristics has been gained.

A couple of gentle test glides will probably establish the need for a tiny bit of clay ballast at either the front or rear of the fuselage. Next, try a few hand winds, and observe the flight pattern. With the offset thrust line, the model should circle to the left, assuming that there are no serious warps, and that the power is kept fairly low. If the model resists turning to the left, a small amount of clay can be added to the left wing tip. Other turn adjustments can be made by means of paper wing-tip tabs, if necessary.

When satisfied with the results, wind in perhaps 100-150 turns and try again. With low power, the model should behave quite docilely, but with great power increases, you may note a pronounced tendency to roll to the right, when first released. Through the years, model canard designers have contrived many different ways of combating this problem, such as alterations in wing positions, other dihedral combinations, counter-rotating props, and so on.

There is another, rather sneaky, approach to the rolling-to-the-right problem that seems to have been largely overlooked. Simply launch your over-powered canard straight up! The model may roll to the right as usual, but in the near vertical attitude, who cares! It seems that once the critical stage has been passed, the model regains its composure and continues on in fine fashion. On the other hand, if it is launched horizontally, the roll to the right is apt to be rudely terminated by contact with the ground.

This is an excellent model to experiment with since it is quick and inexpensive to build, and if damaged, can be repaired easily. After you have succeeded in getting good flights from your "Tail-First Tenderfoot," why not build another, but higher performance version? Here are a few suggestions: 1) Use lighter wood, 2) Sand the corners of the fuselage to reduce weight and streamline, 3) Blend in the wing and leading plane mounts to the fuselage, by careful sandpapering, 4) Round all leading and trailing edges, 5) Try different power combination, 6) Use rubber lube and a wind-er, 7) Keep experimenting!

Will Nakashima



"Bigger! . . . Higher! . . . Faster!"



"Smaller . . . slower . . . calmer."

A free flight kite,
alias Ben Franklin's Revenge,
uses rubber motor for
its own wind.

Stringless Wonder

BILL HANNAN



HERE'S A LOW-COST project which can be completed in a few hours and which is guaranteed to attract attention! Stringless Wonder is the result of a desire to enter something out-of-the-ordinary in a local kite contest. I've always enjoyed flying kites but, like Charlie Brown of "Peanuts" fame, I generally ended up with tangled strings. Solution? Eliminate the string!

The prototype of Stringless Wonder was accepted as a legitimate entry at the kite contest by the judges, who finally decided that my entry simply "made its own wind!" To see just how far rules could be pushed, I also entered my scale towline glider, and it was also welcomed, which goes to show that there are still unexplored ways to have fun with this hobby.

Kites have traditionally been colorful, and Stringless Wonder is no exception. The original is red, white, and blue, but why not let your imagination go wild and really be creative?

Construction

The plan is full-size and should be covered with plastic wrap or waxed paper. Select several straight medium-hard 1/16" square balsa strips, and cut them to the length shown. Cutting the long pieces first will minimize waste. Take time to achieve good fits for maximum strength as well as neat appearance. The outer wing panels and stabilizer are not glued to the wing center section until after they are covered.

After the frames have dried thoroughly, cover them on the top side only (the fin is covered on just one side) with lightweight tissue. It may be applied with clear dope or thinned-out white glue. To prevent warping, pin or weight the parts to the building board

for an hour or two, while the tissue adhesive dries. Do not water shrink or dope the covering, as it would surely distort.

Motor Stick: Select a straight, very hard 1/4 x 1/8" balsa strip and cut it to the length shown. A scrap of 1/8" balsa is glued to the underside of the motor stick to shim it to the size required for a North Pacific propeller bearing assembly. This is the type of plastic thrust bearing which is furnished with Delta Dart kits (AMA Cub), North Pacific Skeeters, and Slick Streak ready-to-fly models. The rear rubber motor hook is bent to shape from a thin-wire paper clip and bound to the rear of the motor stick with thread and glue. Don't get carried away with the amount of thread, or the resulting lump will prevent the wing from

seating properly. Only a few turns of thread are needed.

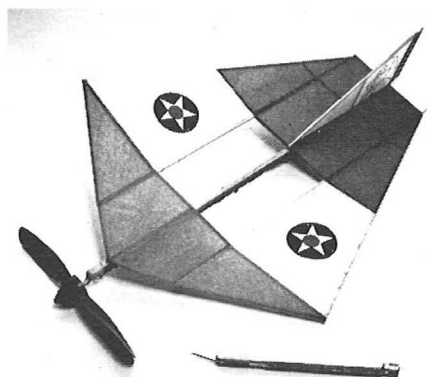
Assembly: The perspective drawing shows the relationship of the various parts. First, place the wing center section flat on the building board and weight or pin it in place. Next, glue on the outer wing panels, adding suitable blocks under each tip for 1 1/4" dihedral per side. Allow plenty of time for drying. Turn the assembly over and add a little extra glue in the V slots at the dihedral joints. Use discretion, as an excess of glue may soften the joints, and the dihedral will be lost.

Next, glue on the motor stick in its correct location. Add the vertical fin, centering it carefully. Then the stabilizer may be installed. It is glued to the underside of the fin, creating an incidence angle. The small paper rudder and elevator (typing paper) are glued in place next.

The optional kite tail is made from tissue about 1/4 in. wide, and two or three ft. long. This is strictly for effect, and helps create the illusion of a kite while flying. An overly long tail will add excess drag and reduce performance.

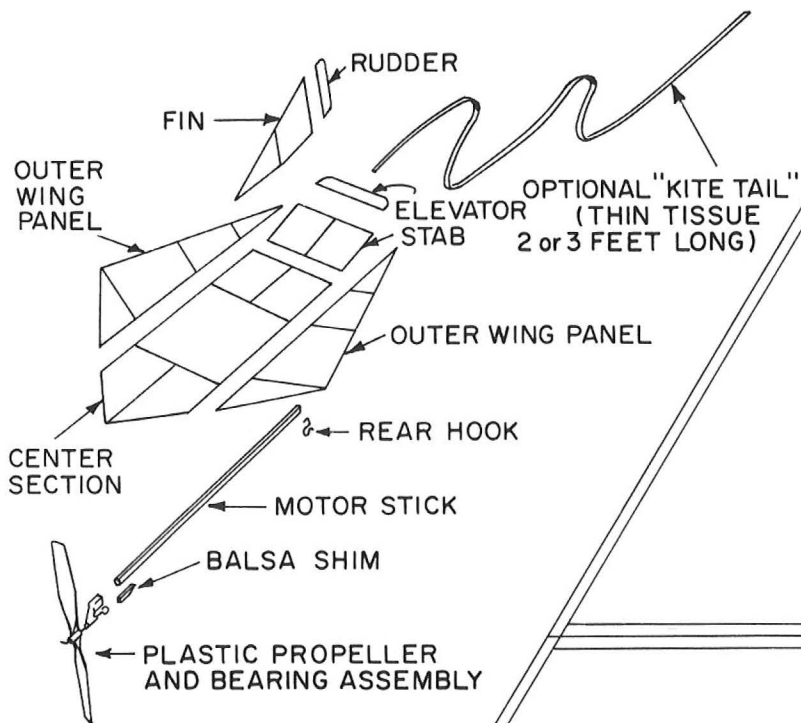
Propeller: The prototype model performed best with a 5 1/2" dia. plastic VF-8000 propeller, which may be obtained from Sig Mfg. Co. This propeller features a neat spinner and also an effective free-wheeling device. The model also has been flown with other plastic props, including the Kaysun 4" dia., Kaysun 5" dia., North Pacific Skeeter (4 1/8" dia.), and the North Pacific Slick Streak (5 1/2" dia.).

Since the model was designed for the VF-8000, which weighs more than any of the others because of its spinner, the substitution of other propellers



Not-so-obvious detail is absence of covering material at center. See plan.

* See note on next page.



EXPLODED VIEW

*NOTE: THE SIG VF-8000 PROPELLER IS NOT BEING PRODUCED CURRENTLY, BUT THEIR NP-PA-055 IS A SUITABLE SUBSTITUTE.

WING CENTER SECTION

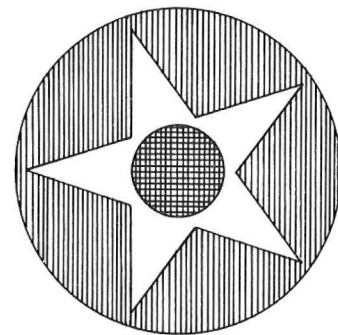
FULL SIZE PLANS

"STRINGLESS WONDER"

FREE FLITE KITE
(BEN FRANKLIN'S REVENGE)

BY BILL HANNAN

1/8" HARD
BALSA
SHIM



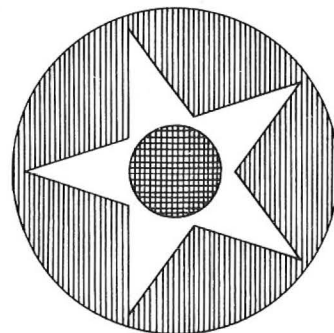
OUTER WING PANEL

THIS AREA
IS NOT COVERED
WITH TISSUE

POSITION OF
MOTOR STICK

BALANCE
POINT

OUTER WING PANEL

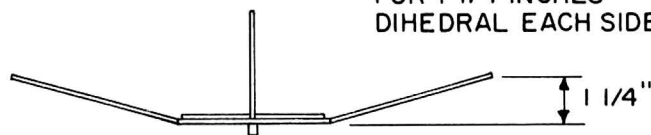


MOTOR STICK

1/4" x 1/8" HARD BALSA

POWER: ONE LOOP OF 3/32" OR 1/8" RUBBER.
EXPERIMENT FOR BEST RESULTS !

BLOCK UP WING TIPS
FOR 1 1/4 INCHES
DIHEDRAL EACH SIDE



FRONT VIEW

(NOT TO SCALE)

NOTE: IN PECK-POLYMERS KITS AND OTHER NEWER STRINGLESS WONDERS, THE STABILIZER IS NOT A SEPARATE PART, AND IS FLAT WITH THE WING CENTER SECTION. IF CONSTRUCTED THAT WAY, EXTRA "UP" ELEVATOR MAY BE REQUIRED.

1/16" SQUARE MEDIUM-HARD BALSA
(TYPICAL)

ELEVATOR

(TYPING
PAPER)

STABILIZER

1/16" SQUARE
BALSA

FIN

RUDDER

(TYPING
PAPER)

MUSIC WIRE HOOK
WITH THREAD BINDING

will require adding nose weight, such as modeling clay. Regardless of the type of propeller, spend a few extra minutes checking its balance. A little sanding of the heavy blade will reduce vibration and improve performance. Also, several tiny brass thrust washers and a drop of oil will do wonders. Without them, the plastic prop will gradually wear down against the plastic bearing assembly and won't turn as freely.

Flying

Make up a single loop of 1/8" brown rubber, allowing a little slack between the hooks. With the motor in place, the aircraft should balance at about the point indicated on the plan. If not, add a small amount of modeling clay to the nose or tail, as required. Next try a gentle glide (do not throw). The model should float to the ground with perhaps a slight mushing effect. If it dives, add a little up elevator or subtract some nose weight. If it stalls (noses up suddenly, then dives) add clay to the nose.

Wind in 75-100 turns and launch the model gently, parallel with the ground. It should exhibit a natural tendency to climb in a shallow turn. If it turns too tightly, compensate with a slight bending of the rudder in the direction opposite to the turn. If the model falls off on one wing repeatedly, add a small lump of clay to the opposite wing tip. Gradually increase the number of turns and readjust, as required.

If very high power is used, it may be necessary to increase the down-thrust of the propeller. A fair amount is built into the North Pacific thrust bearing assembly. It is also easy to add right or left thrust adjustments by bending the bearing assembly slightly.

In spite of its kite motif, this model should be flown in calm weather, at least until familiar with its performance and adjustments. When all is satisfactory, lube the motor and pack in the turns with a geared winder for best performance.

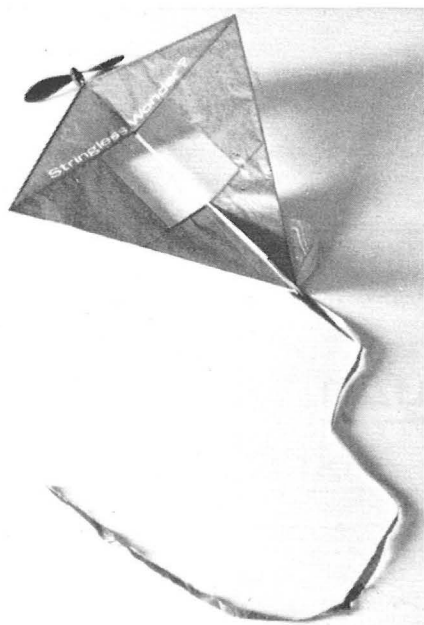
This craft is also known as Ben Franklin's Revenge. Because of an archaic law, of obscure political origin,

kite flying is illegal in Washington, D.C. Since model airplanes are (apparently) allowed, it would seem that string is the real offender. We wonder if America's most celebrated kite flyer, Ben Franklin, might consider Stringless Wonder a possible "key" to this problem!

Editor's Note: Happily, the law against kites has been revoked, thanks to appropriate lobbying of Congress. So, come to Washington and join us, flying kites on the Mall! ■

POSTSCRIPT: Stringless Wonder was kited by Peck-Polymers and sold by the thousands. Variations on the theme have included Dave Linstrum's "Stringless Mutant" and Ed Toner's enlarged "No Small Wonder." Regarding performance, Daniel Walton was moved to write: "Old Stringless Wonders never die; they just fly away."

FLYING WINGS



On an historical note, a small review of this design may be in order: The original "Stringless," complete with tail, is illustrated in one of our photos. It was entered as a gag in a Palomar College kite contest in San Marcos, California, during 1970, as part of a team effort with Ken Hannan and the late Russ Barrera. At first, the meet organizers were reluctant to allow entry of "a kite without a string," and a meeting of the judges was convened. In what seemed a quite generous decision, they concluded that the entry was indeed a kite, but that it simply "made its own wind" via the rubber-driven propeller on its nose!

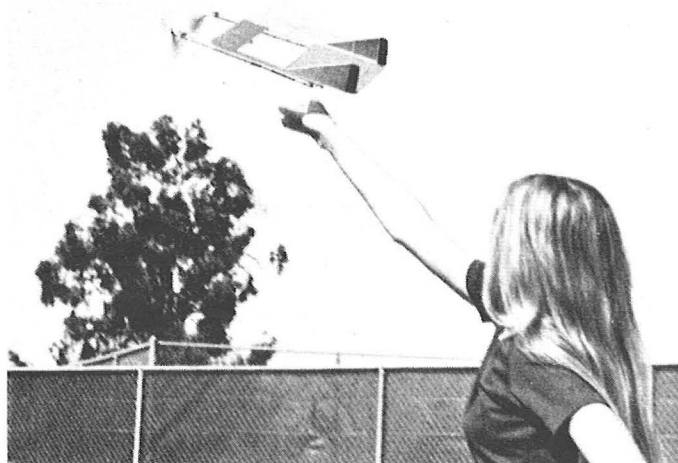
Actually, it was a marginal performer at best, so after the contest it was extensively redesigned. After placing third in class at the 1970 Northrop Wing Contest, it was published in *American Aircraft Modeler*.

In 1971, the late Jack Lueken flew an enlarged, gas powered "Wonder" to second place in the Northrop meet, and by 1974 the Walton brothers were com-

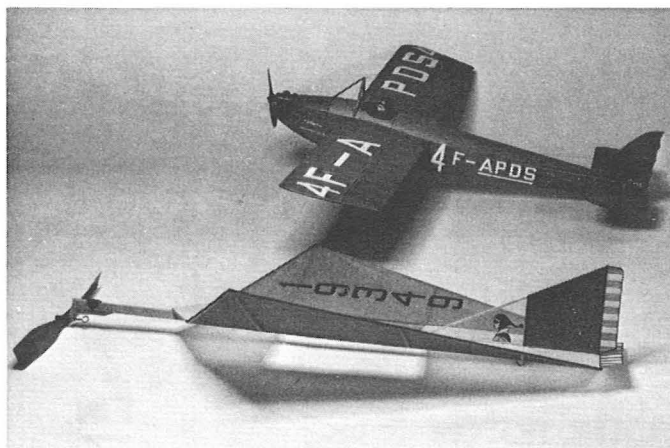
peting with CO₂ powered variations. Bob Peck won first place in the 1975 Northrop meet with his "Wonder," and his daughter Jill placed fourth with hers.

During 1977, the Northrop Wing event was conducted as part of the California Nationals at Riverside, and *Stringless Wonders* were flown in the gas class by both Jim McDermoth and Jack Lueken, while the rubber event was won by another *Wonder*, which disappeared over a mountain in the process.

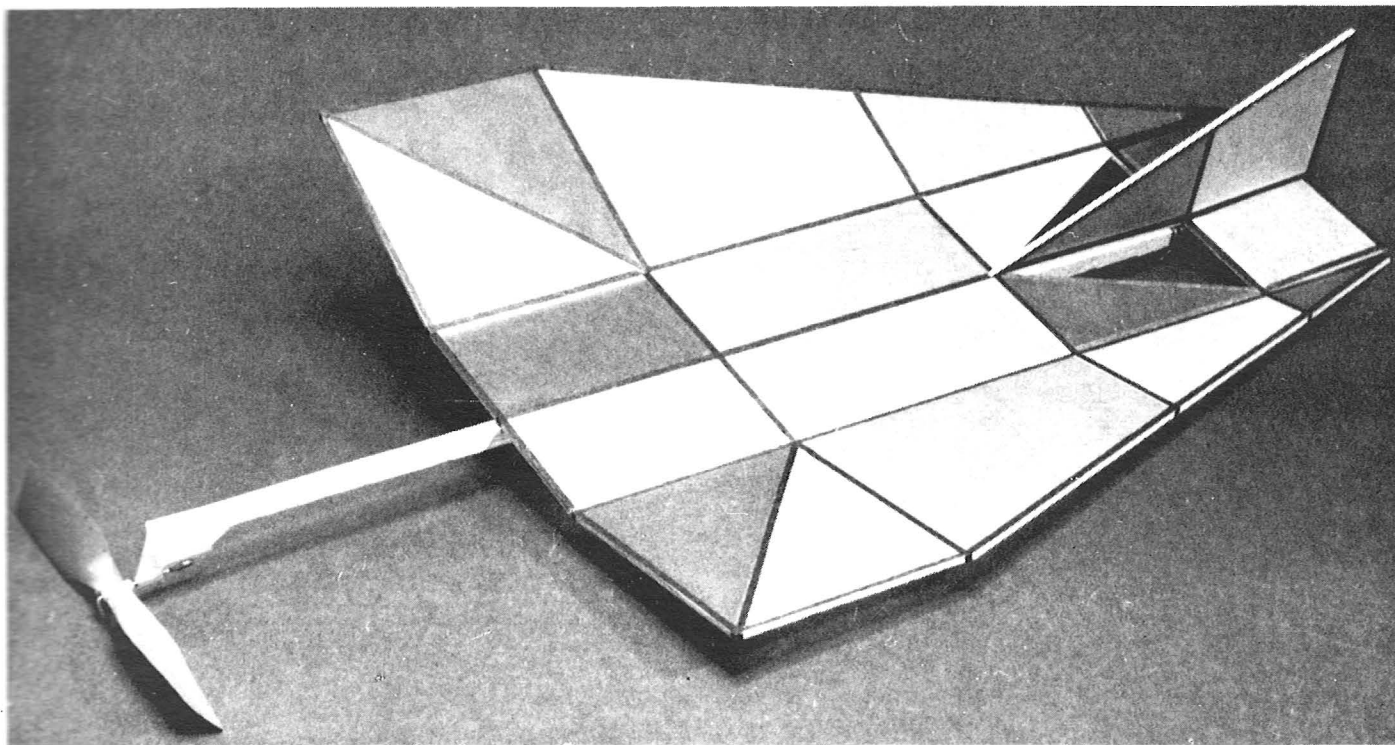
Upon winning the 1981 rubber event of the Wing meet, more than a few grumbles were heard from other contestants, centering upon the "hole" in the middle of the wing. To some, this seemed to render the aft portion of the design too much like a tail to constitute a true flying wing. Thus, the hole was covered for the 1982 contest, and although the model still flew, its performance was only mediocre and it did not place. With the announcement of the *Stringless Wonder* ban for 1983, the model was presented to Contest Director Carl Hatrak as a small memento of the retirement. ■



Jill Peck (Peck-Polymers) modified a "Stringless Wonder" to accept twin motor sticks. A very impressive flyer.



The final *Stringless Wonder* as flown at the 1981 Northrop Contest. CO₂ powered Farman *Moustique* is also retired now.



Stained-Glass Window

A rubber-powered kite, the man called it!
If you fly it in the church parking lot, you'll have
a nifty excuse when the reverend comes out
to investigate.

Here is an easy-to-build little flyer that attracts a great deal of attention wherever it is flown. It is the most recent in a series developed by the author which was based upon kites. An earlier and larger model called "Stringless Wonder" was published in the April, 1971 *American Aircraft Modeler*. Both designs have placed well in flying-wing contests sponsored by the Northrop model airplane club, and enlarged versions have flown with CO₂ and glow-engine power.

Construction: Since our plan is presented actual size, you can begin building right away, after protecting the drawings with a sheet of clear plastic wrap. Select straight fairly light 1/16" square balsa strips, with the exception of the leading edge members which should be hard grade to withstand possible impact damage during landings. Cut the longest pieces first, and use the leftover portions for the short members. In this way, very little precious wood will be wasted. When pinning the strips down, angle straight pins inward on each side, rather than piercing the wood, which would weaken it. The original model was constructed with "Titebond" glue, which worked very well. Note that the outer wing panels and elevator are not glued to the wing center section until later.

After the frames have completely dried, carefully remove them from the building board. Lightly sandpaper the structure to remove any lumps of glue or other roughnesses, before covering. It is also a good idea to inspect each glue joint carefully, and if necessary, to recement.

Covering: Here's a good chance to let your imagination run wild! The more colors, the better. Use any arrangement of your choice, but it is best to try the general effect with bits of tissue before affixing them in position.

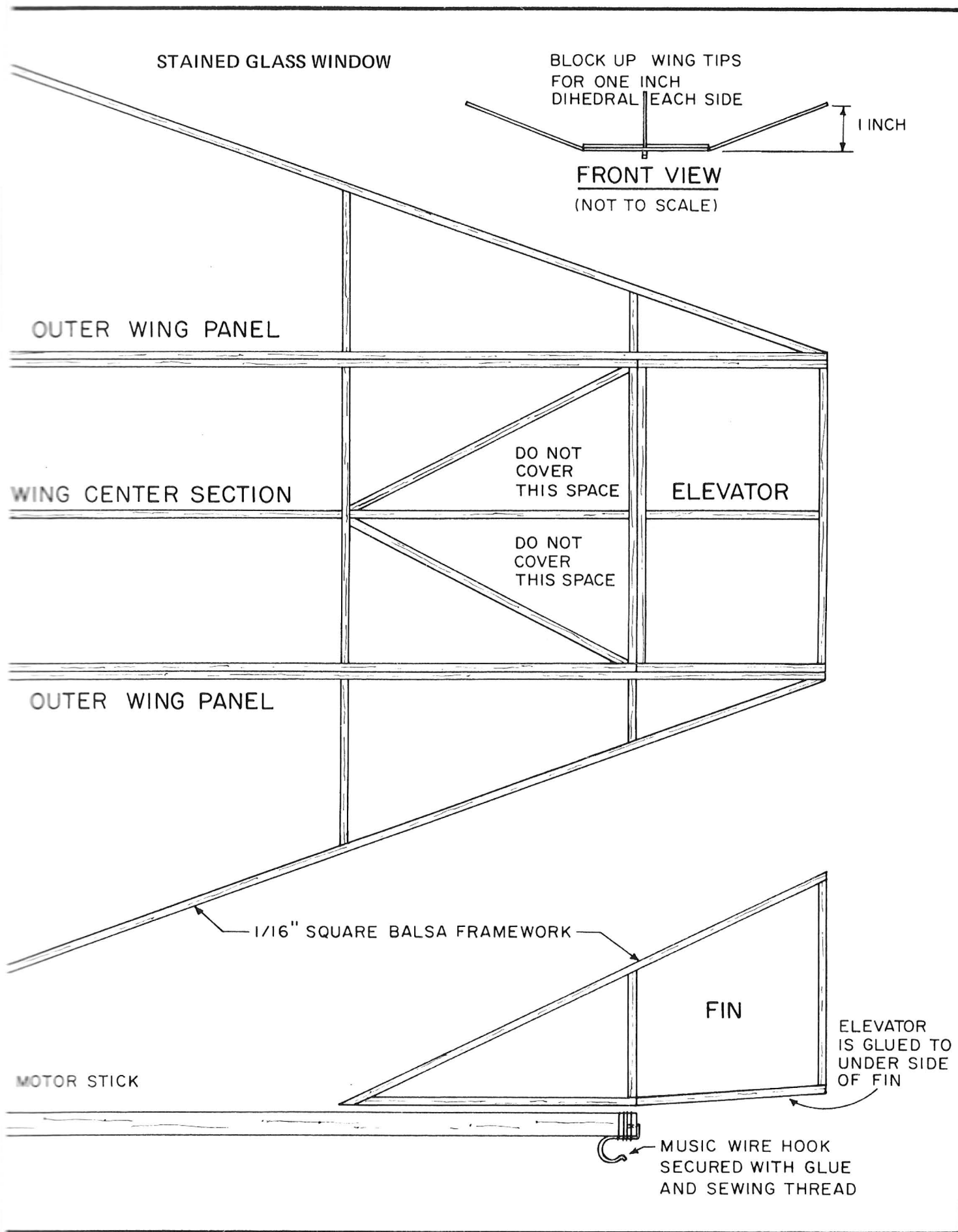
Note that only the top surfaces of the wing and elevator are covered, and only one side of the fin. The tissue should not be water shrunk, as warps would probably result. For an even greater resemblance to a stained glass window, thin strips of black tissue may be added between the different colors of tissue. This represents the lead used to separate and secure the glass in a real window.

Motor Stick: Select a stiff, straight section of 3/16 x 1/8" balsa, and cut it to the length shown. A scrap section of the same material is glued to the lower front end and trimmed to be a snug fit in a North Pacific "Skeeter" prop bearing assembly. The rear rubber retaining hook is bent to shape from music wire, and attached to the rear of the stick with a few turns of thread and glue.

Assembly: The little exploded view shows the relationship of the various parts. Pin or weight the wing center section to your building board, again using plastic wrap to protect the drawing. Apply glue to the outer wing panel joint areas, slide them into position against the center section, and prop up each tip 1" for dihedral.

The motor stick may now be glued in its correct position, and the vertical tail (fin) added. Install the elevator directly against the fin lower side for incidence. The propeller bearing assembly is added last.

Flying: A single loop of 3/32" wide rubber was used for power on the prototype. With the rubber motor installed the craft should balance at about the place shown on the plan. If not, add a small lump of modeling clay to either the tail or nose. Try a few hand glides, giving the model only a gentle



AYEN to Fly

Here's an inscrutable way to flip a coin . . .



Short-stick version with landing gear.

HERE'S A LITTLE flying novelty . . . sort of a visual pun, which resembles an old oriental coin. It can be constructed inexpensively and is almost guaranteed to attract interest wherever it is flown.

Construction: A soft building surface, such as insulation board, into which pins may easily be pushed, is recommended. The outline of the wing is laminated around a circular object of 8 inches diameter. A slightly larger size would be O.K., but a smaller diameter is apt to lead to stability problems. We used a pan lid for a form, but a disc cut from cardboard would serve equally well. Wax the edge of the form with either paste wax or a white crayon, to prevent glue from adhering to it. Place the form over a sheet of clear plastic kitchen wrap or waxed paper.

Bass wood strips, available from model railroad shops, Peck-Polymers or Vintage Aero are suggested, but $1/16 \times 1/64$ " or $1/16 \times 1/32$ " balsa strips would be satisfactory. Soak the strips in water to soften them, then wipe off the excess moisture.

Titebond or white glue, slightly thinned with water, is used as an adhesive. We prefer to apply it with a small pointed brush for best control. Wrap the strips around the form, adding glue between each layer, and staggering the end joints for strength. A total of three layers is used. Straight pins, quite closely spaced, are used to hold the strips tightly against the form while drying, preferably overnight.

When thoroughly dry, pin the circular "hoop" over the plans. If you have made an oversize hoop, the internal wing structure must be extended to meet the edges. Glue the $1/16$ -sq. strip structure in position as indicated. When dry, cut the outline at the dihedral and elevator joints, so that the edges may be raised. For greatest strength and neatest appearance, the joint edges should be beveled where they meet. Note that the dihedral sides are raised $\frac{3}{8}$ in. each, but the elevator is only lifted $3/16$ in. to match the angle on the underside of the fin. Small pieces of scrap wood can support the parts while they are glued in position.

After the wing has dried, remove it from the building board, and cover it on the top side only, with lightweight tissue. Yellow is appropriate, to resemble the brass color of the old oriental coins. Tissue may be secured either with thick clear dope or thinned white glue. But do not shrink or dope the covering, as warping will almost surely result. Note that the square central portion of the wing is not covered.

Construct the vertical fin from $1/16$ -sq. balsa strips. We covered ours on both sides, but one side would be adequate. Note the small paper rudder for adjustment purposes.

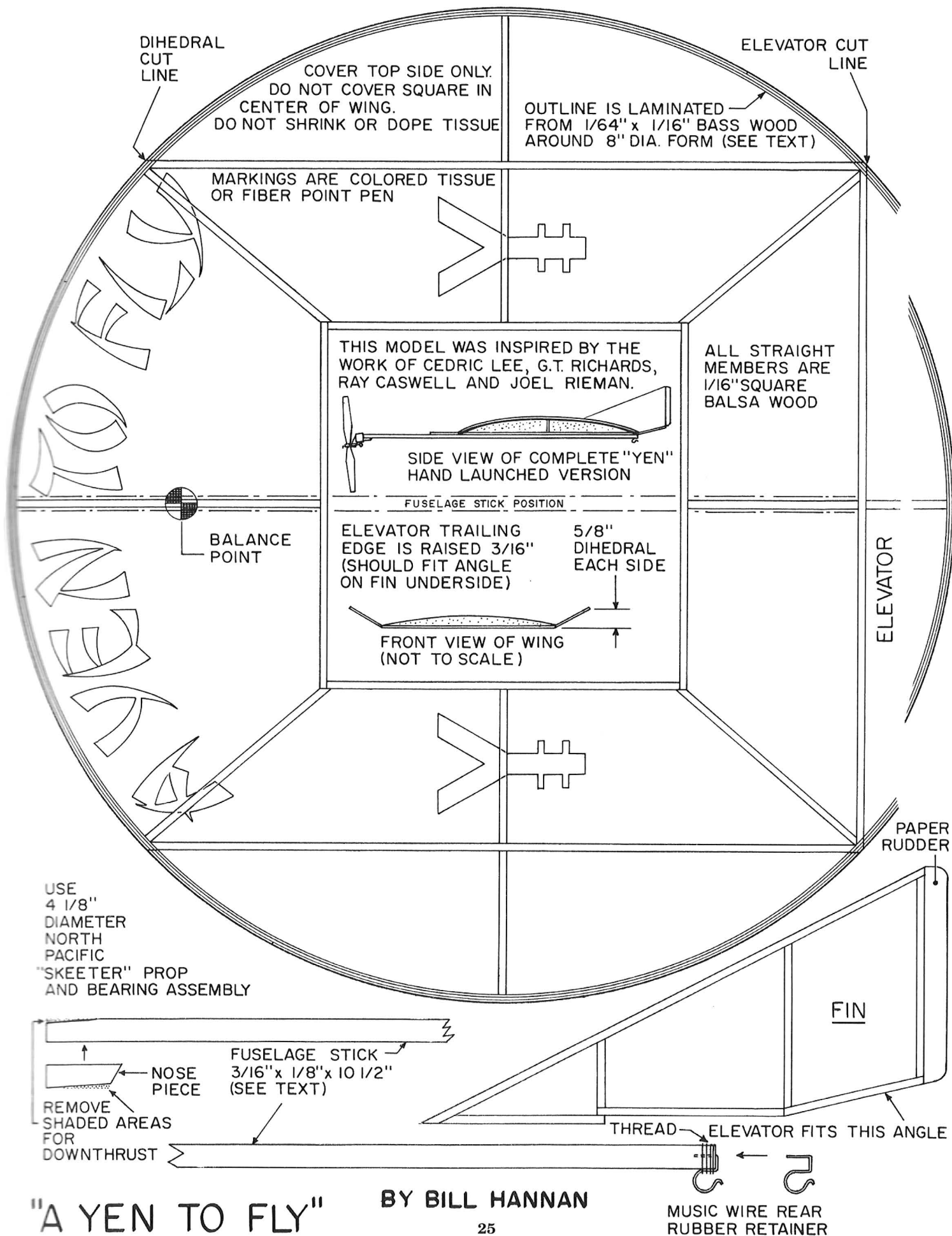
The fuselage stick is a $3/16 \times 1/8$ " balsa strip selected for its straightness and stiffness. Cut it to $10\frac{1}{2}$ -in. length, if you are building a hand-launched model. Cut an additional short piece of the stock for the nose piece, as shown, but do not glue it on at this time.

Bend the rear rubber hook from thin music wire, force into the rear of the fuselage stick, and secure with a film of model airplane cement or epoxy.

Decor: The decorations add to the charm of this aircraft, and may be applied in either of two ways. Fastest, but probably not the neatest, unless you have an unusually steady hand, is to simply draw them on with a brown or black fiber-point pen. The second, and more difficult method, is to cut the markings from colored tissue paper. A good approach to this is to trace the characters onto thin paper, and to tape it over the colored tissue, which in turn, is taped to a sheet of cardboard. A sharp-pointed modeling knife is used to carefully cut through the tracing paper, colored tissue, and just slightly into the cardboard beneath. The results should be clean, neat tissue edges. Note that both "YEN" signs may be cut at once, by using two layers of tissue. Apply the characters, with clear dope.

Assembly: Glue the wing onto the fuselage stick, being certain it is properly aligned. Add the vertical fin, centering it on the assembly, as viewed from the top. It should also be vertical as seen from the front of the model.

Balancing this aircraft is somewhat different than usual: Slip a North Pacific "Skeeter" propeller and bearing assembly onto the front of the fuselage stick. It will, of course, be a loose fit at this stage. The model should balance near the point indi-



cated on the plans. Probably, however, it will be slightly nose-heavy. If so, cut a small amount off the front of the fuselage stick, replace the prop assembly, and balance again. Repeat until model will hang level when supported by the finger-tips on each side of the balance point. Now glue on the lower nose piece, and bevel the top of the fuselage stick to obtain a downthrust angle. Reinstall propeller assembly.

Flying: Install a short loop of 3/32 or 1/8-in. rubber, and try a few test glides. These may be performed indoors if you have enough room space, or outside in calm conditions. The craft should have a long, straight glide. If model dives, trim a tiny bit more off the front of the fuselage stick and try again. If it stalls, a small amount of clay ballast may be added to the fuselage front.

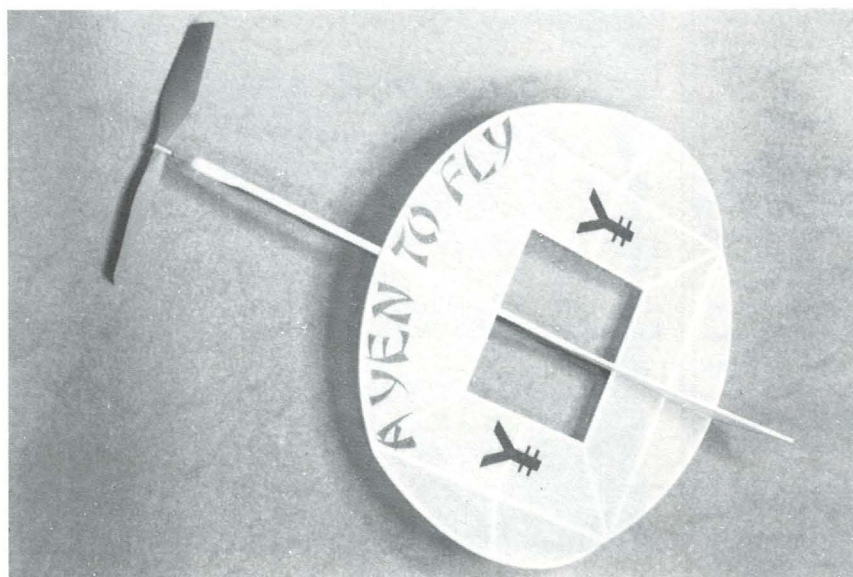
Now, wind in about 75 or 100 turns of the rubber motor and launch gently. If model turns excessively, it may be corrected by bending the paper rudder opposite the direction of the turn. In extreme cases, a tiny amount of clay ballast may need to be added to the wing tip opposite the direction of the turn. Gradually increase the number of motor winds until the model can safely handle a full row of knots or more. An increase in power may, however, bring about the need for slight changes in balance or turn adjustments.

Next, a longer, lubed rubber motor may be installed, and winder wound for best performance. You may wish to experiment with different sizes and loop lengths. If model loops under high power, slightly increase the downthrust angle.

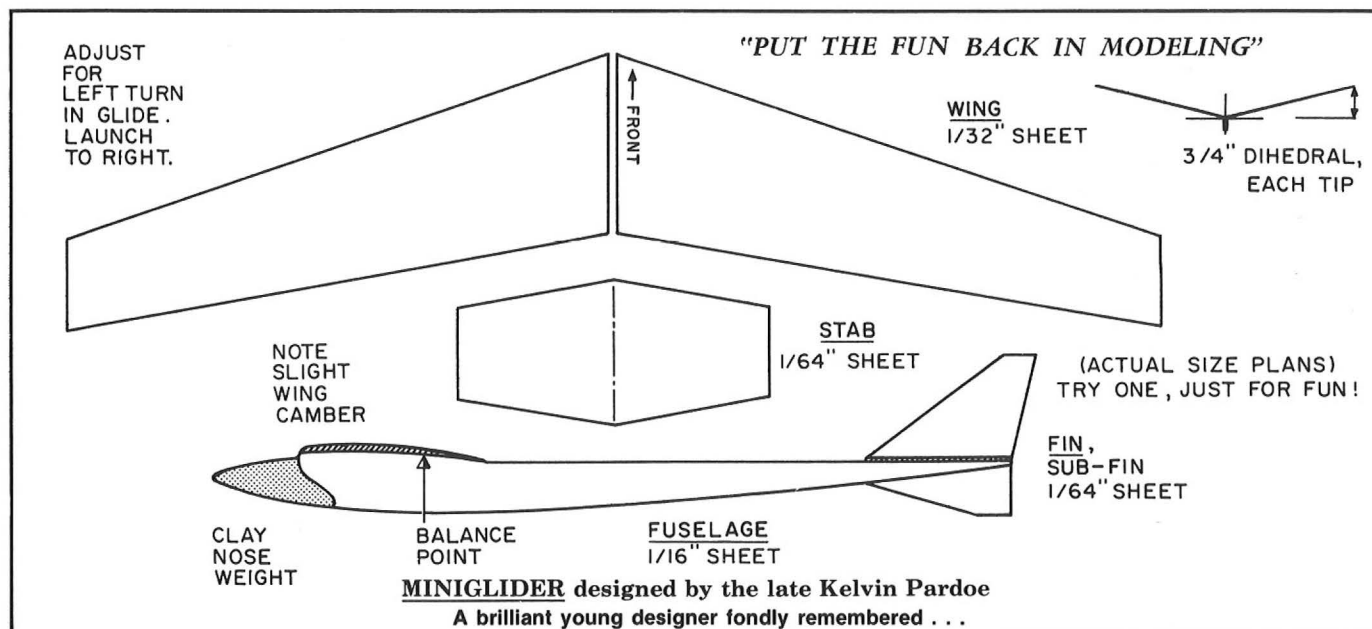
Optional: This craft may easily be

equipped with landing gear, which will permit rise-off-ground starts, with some decrease in overall performance. The complete landing gear assembly from a North Pacific Sleek Streak may be installed by forcing the Skeeter prop bearing assembly on, with the landing gear wire held in position on the fuselage stick. Alternatively, you could bend your own wire gear legs, and add small-diameter balsa or light-weight plastic wheels. Naturally, the fuselage stick will need to be shortened, and the lower nose piece reinstalled, to restore the correct balance. On our model, the change to landing gear resulted in the need to shorten the fuselage stick to 8 3/4 in. length.

So there you have it, an inscrutable way to flip a coin! Thought starter: Wonder if a Silver Dollar based upon this idea, might really make it across the Potomac River?



Long-stick version without landing gear.



FLY△NGLE

For added realism this rubber-powered cutie is a slightly advanced version of the basic Delta Dart.

PROBABLY the most influential simple model of this decade has been the Delta Dart. Designed by AMA Technical Director Frank Ehling, the model was published in the much-lamented "Sig Air-Modeler" magazine during 1966. It was known at the time as the "AMA Racer." In April of 1967, *American Aircraft Modeler* featured plans under the name "Delta Dart," which seems to have been the most widely accepted name for the species. A modified version kitted by Sig Mfg. Co. is called the "AMA Cub." A larger, glow-engined variation called "Oily Bird" appeared in the Oct. '68 issue of *American Aircraft Modeler*.

"Flyangle" represents an effort to produce a slightly advanced version of the basic idea, incorporating a fuselage and other items intended to add a degree of realism. While the model is not as simple to construct as the Delta Dart, anyone who is willing to work carefully should be able to produce an attractive, flyable aircraft.

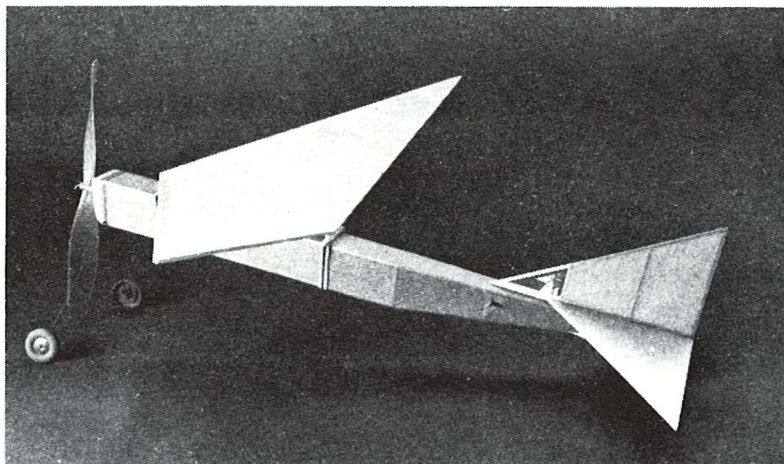
Materials: Medium-hard balsa can be used throughout, with the exception of the fuselage longeron, nose block, and wing mounts, which should be made of hard balsa. When selecting wood for the job, choose straight, warp-free pieces, which may be found by sighting down each strip from end to end.

Construction: Build the model on a flat surface in order to prevent any built-in warps. Spend a few minutes looking over the plans and photos to be sure that you understand the relationship of the parts. Since the plans are printed full-size, you may build directly over them. A sheet of waxed paper or clear plastic food wrap will keep glue from sticking to the plans.

Fuselage: Cut the fuselage top panel from $\frac{1}{16}$ " sheet balsa, and sandpaper the edges lightly to remove any roughnesses. Mark the position of each triangular fuselage former on the panel, using a soft pencil or ball-point pen. Next, cut out the various formers. Since the fuselage is constructed upside down, the top panel will actually be on the bottom during the building stage, and may be held flat against your building board with straight pins.

Glue each former in its correct location, checking that all are vertical for proper alignment. Allow the formers to dry, then add the $\frac{1}{16}$ " sq. hard balsa longeron, which will need to be cracked at the rearmost F2 former, in order to permit the change in angle at that point. Cut out and install the triangular rear rubber-peg retainers. It is easiest to make only a pin hole where the peg fits in each retainer, at first. Then, enlarge the holes to proper size after the retainers are installed and have dried. This will assure correct peg alignment. Add a second coat of glue to the former and peg retainer joints, as they are subject to strain when the motor is fully wound.

After the fuselage assembly has dried, remove it from your building board and sandpaper any rough places. By using a small sanding block or emery board, it is easy to blend in any edges or corners that may protrude. The time spent in doing this will make the task of applying the covering much easier.



It has its good points—all over the place. Delta Dart-type wings and tail minimize dangers of warps in the surfaces. That's important if it is to fly successfully.

Landing gear: The landing gear legs are bent from a piece of .025-diameter music wire, using needle-nose pliers. The wheels used on the original model were plastic, but could just as well be wood. The size is not too important, and anything from about $\frac{1}{2}$ " up to 1" diameter should prove satisfactory. The wheels are retained by bending the axle ends upward. For good ROG (rise off ground) starts, the wheels should revolve freely. Note that the landing gear legs are bent slightly to the rear to provide propeller clearance.

The landing gear wire is sandwiched between F1 and F1-A using plenty of glue. A clothespin or two can be used to clamp the assembly together while the glue dries.

Noseblock and prop: The noseblock can be made from a $\frac{3}{16}$ "-thick piece of hard sheet balsa, with a $\frac{1}{8}$ " hard balsa sheet triangular plug glued on, or the block may be laminated from $\frac{1}{16}$ " hard balsa sheet. In either case, the nose plug should be a snug fit into F1, so that it will not fall out during flight. The prop shaft bearing is a short length of $\frac{1}{16}$ "-diameter aluminum or brass tubing. Note that it is mounted in a slanted hole to provide 4-5 degrees of down-thrust. Roughen the outside of the tubing with a file or sandpaper, and glue it into the nose block. Be certain to clean out any glue that may find its way into the inside of the bearing.

The prop shaft may be formed from a piece of music wire, with the aid of needle-nose pliers. Any suitable plastic prop from 5" to 6" in diameter may be employed, but a North Pacific "Sleek Streak" prop was used on the prototype. Add enough small washers or sequins to the prop shaft so that the propeller will clear the corners of the noseblock. Also, apply a drop of oil to reduce friction.

Wings: The wing panel is constructed directly over the plan from $\frac{1}{16}$ "-sq. medium-hard balsa strips, which are held down while drying, with straight pins. Do not puncture the strips with the pins, as that

would weaken them. After the wing panel has dried, it may be removed from the board, and a second one exactly like it may be built.

The wing mounts are cut from hard $\frac{1}{16}$ " balsa sheet, and glued to $\frac{1}{16}$ "-diameter hardwood dowels. These may be obtained at low cost from a drug store, by asking for "swab sticks." The rear rubber peg is also made from one.

Tailplanes: The tail parts are made from $\frac{1}{16}$ " balsa strips in the same manner as the wing panels. Note that there is an extra piece of $\frac{1}{16}$ " sq. at the lower front part of the fin. Cut the small triangular sub-fin (which also serves as a tail skid) from $\frac{1}{16}$ " sheet balsa.

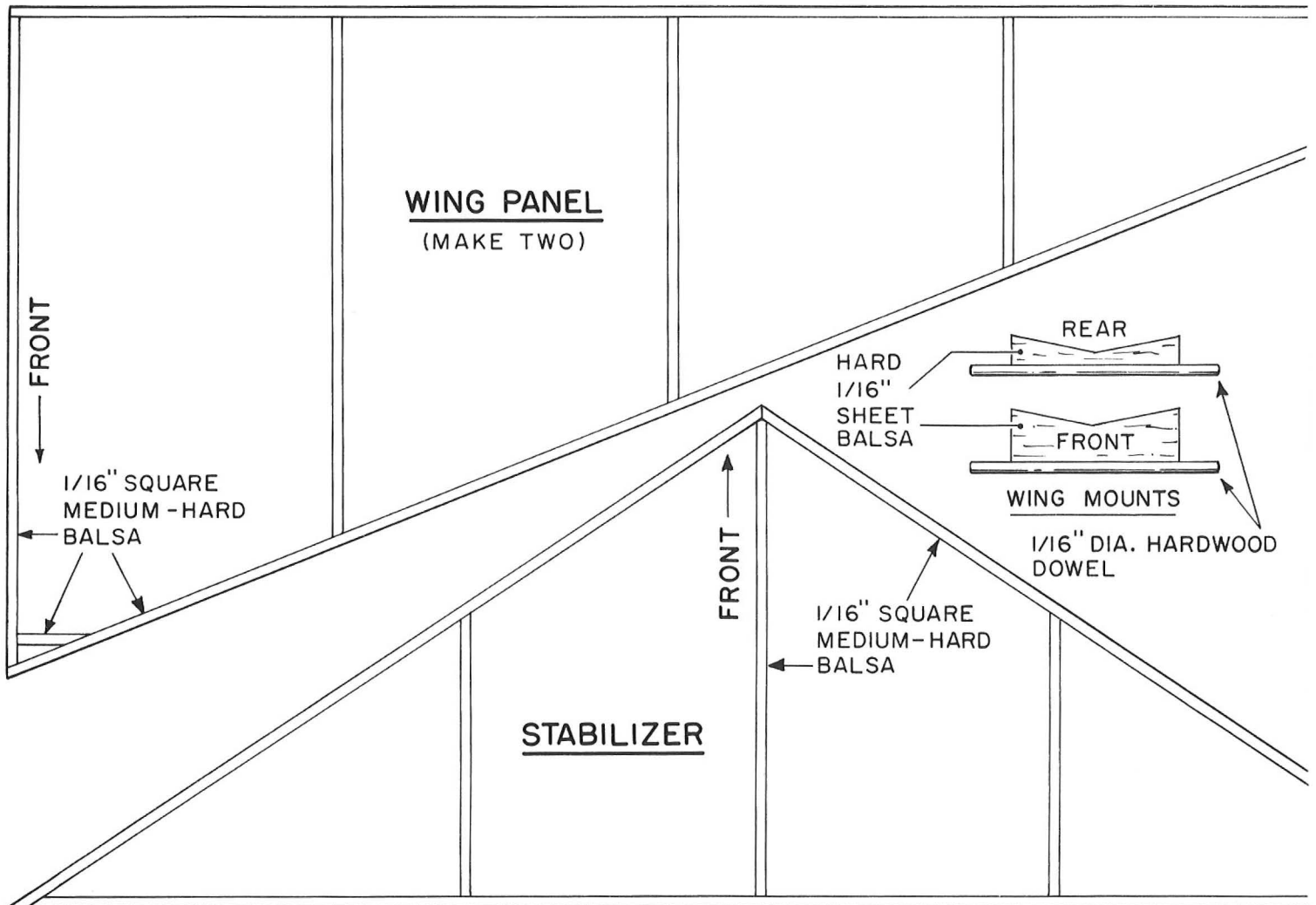
Covering: There are several approaches to covering a model with tissue, but our favorite is as follows: Apply several coats of clear dope to each part of the structure where the tissue will be secured. The use of a plasticized dope, such as Sig "Litecoat" will reduce the chance of warping. Also, even though the wings and stab are only covered on the top side, it is a good plan to dope both sides of the structure to minimize warping, caused by the action of the dope drying. The small amount of additional weight is more than offset by the efficiency of good, true flight surfaces.

After the dope has been applied (usually two or three coats are required), cut a slightly oversize piece of tissue paper and place it over the framework to be covered. Using a small brush, flow some dope thinner through the tissue, along the previously doped structure. The thinner will penetrate the tissue and soften the clear dope film underneath enough to render it sticky. Do only a few inches at a time, and press the tissue firmly against the structure. If the tissue develops a bad wrinkle, apply thinner, pull it off, and try again. Work your way around the entire outline, then put the part aside to dry for ten or 15 minutes. The excess tissue may be neatly trimmed from the structure, with a sharp razor blade. Check for any areas that may have popped up or worked loose. A light application of thinner and/or dope should take care of them.

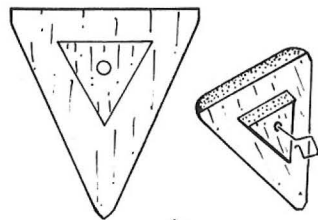
It is only necessary to cover the two fuselage sides, but we elected to cover the top also to achieve a more uniform color scheme. The wing and stab, as mentioned earlier, are covered on the top side only. The fin would only need to be covered on one side, but its appearance is much better when covered on both sides. The forward cockpit portion of the fin is covered with cellophane. Don't forget to put the paper pilot inside!



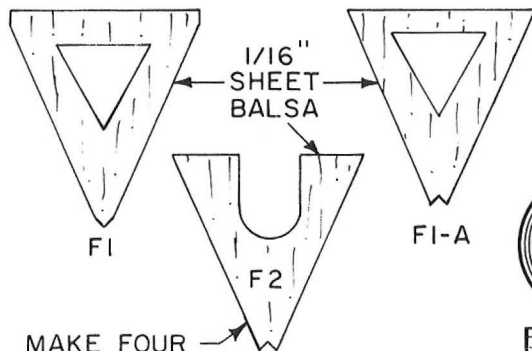
WING PANEL (MAKE TWO)



PROP SHAFT BEARING
1/16" DIA. METAL TUBE



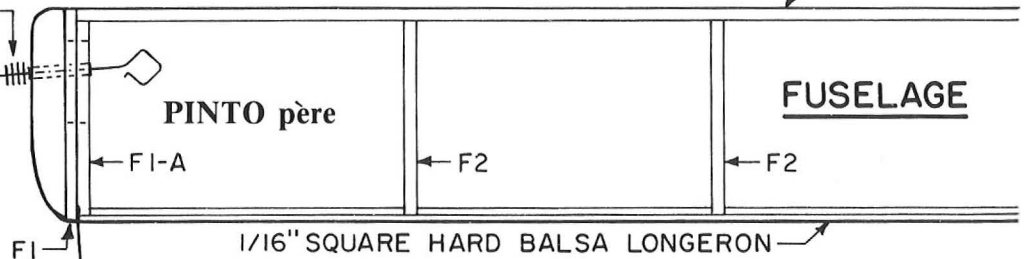
BACK OF NOSE BLOCK
SHOWING 1/8" THICK
TRIANGULAR NOSE PLUG
NOSE BLOCK IS MADE FROM
3/16" THICK HARD SHEET BALSA,
OR THREE LAMINATIONS OF
1/16" SHEET.



MUSIC WIRE PROP HOOK

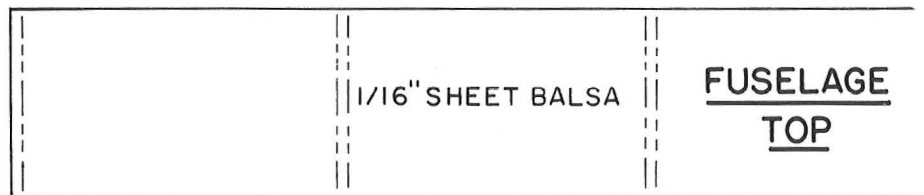
1/16" SHEET BALSA FUSELAGE TOP

WASHERS
4 TO 5°
DOWN-
THRUST



FUSELAGE

1/16" SQUARE HARD BALSA LONGERON

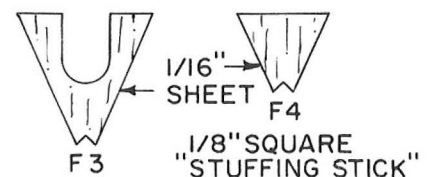


FUSELAGE
TOP

NOTE THAT LANDING GEAR LEGS ARE BENT SLIGHTLY
REARWARD FOR PROPELLER CLEARANCE.

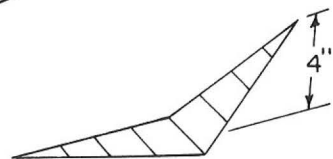
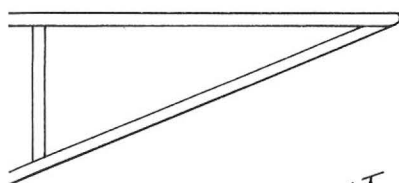


PLASTIC OR
WOODEN WHEELS



1/16" SHEET
F4
1/8" SQUARE
"STUFFING STICK"

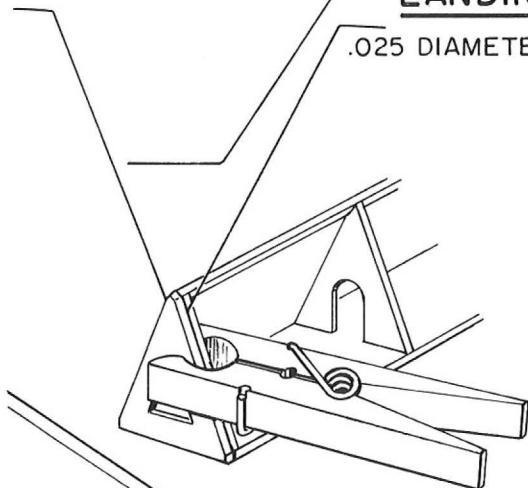
← SLIGHTLY ROUNDED TIPS



DIHEDRAL
DIAGRAM

LANDING GEAR

.025 DIAMETER MUSIC WIRE



LANDING GEAR IS
SANDWICHED BETWEEN
FI AND FI-A AND
CLAMPED UNTIL
GLUE HAS DRIED.

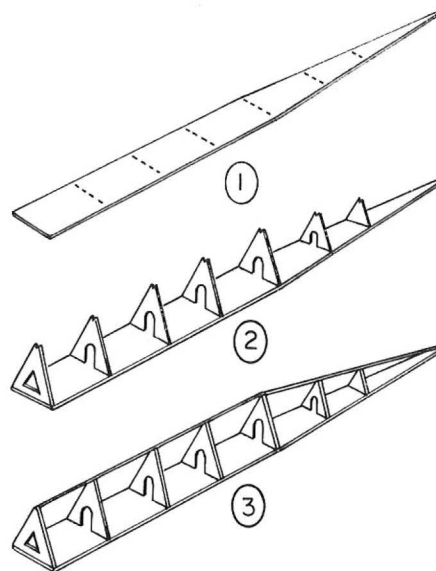


PEG
RETAINER

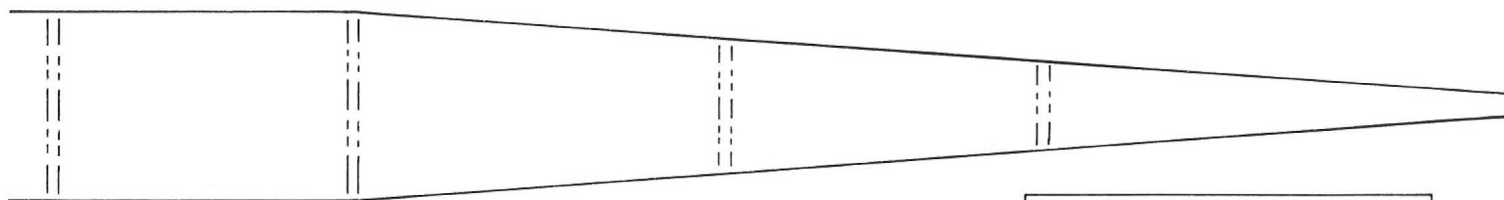
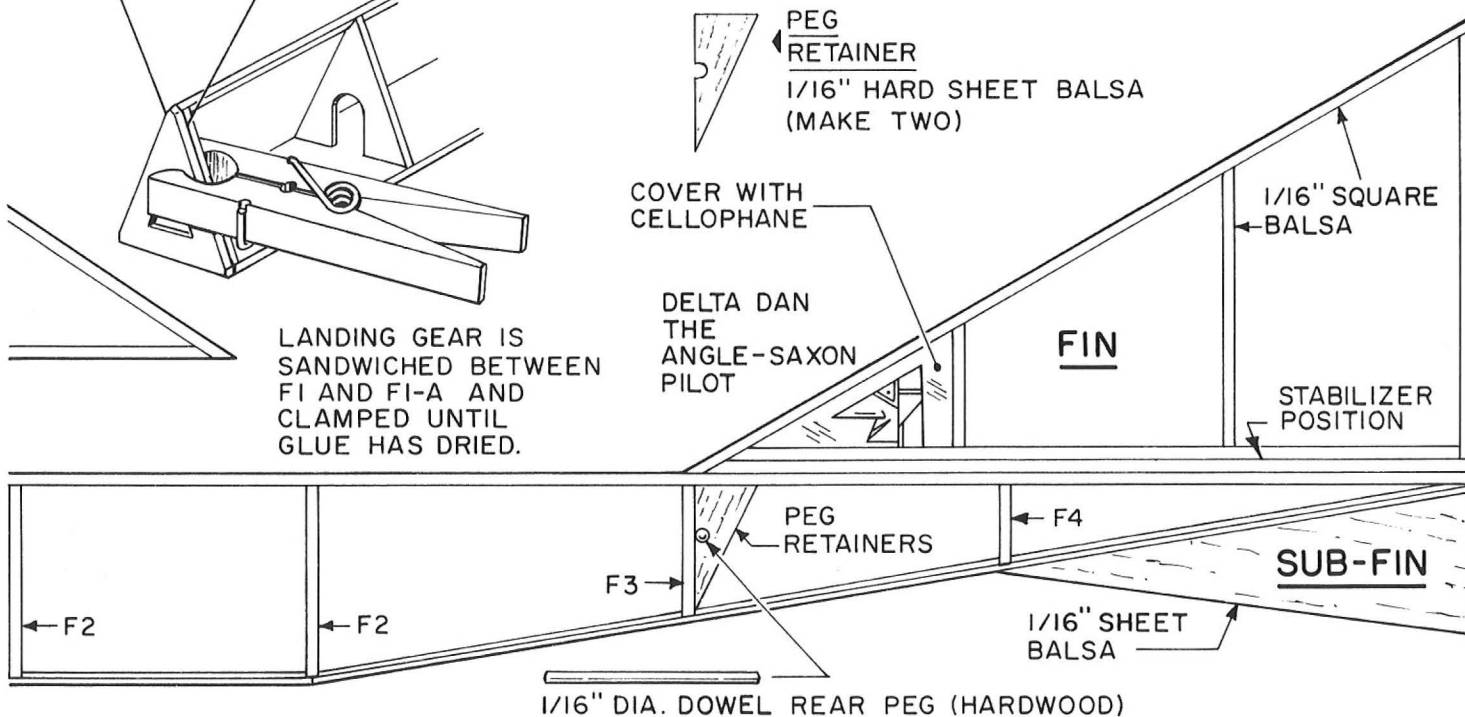
1/16" HARD SHEET BALSA
(MAKE TWO)

COVER WITH
CELLOPHANE

DELTA DAN
THE
ANGLE-SAXON
PILOT



FUSELAGE CONSTRUCTION



1/16" DIA. DOWEL REAR PEG (HARDWOOD)

NOTE: ANY SUITABLE PLASTIC PROPELLER
FROM 5 TO 6 INCHES DIAMETER MAY BE EMPLOYED.

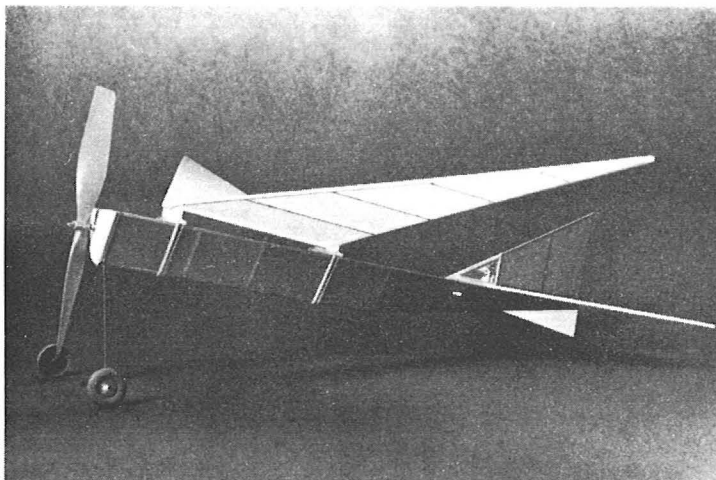
THE PROTOTYPE USED A 5 1/2 INCH DIAMETER
NORTH PACIFIC PROP AND A SINGLE LOOP OF
1/8" FLAT BROWN RUBBER.

FLY△NGLE

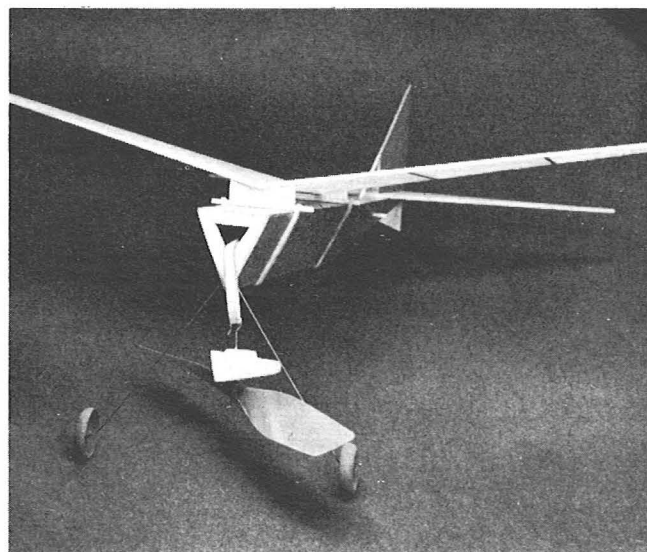
(SON OF DELTA DART)
FULL SIZE PLANS
BY BILL HANNAN

FOR INSERTING RUBBER MOTOR

TWO PIECES 1/16" SQUARE HARD BALSA



Simple wing mounts and rubber-band attachment show clearly here. Wing slides back and forth for making necessary corrections in balancing. Article describes how to adjust model.



The fuselage covering may be lightly shrunk with water, but the wing and tail-planes are left alone and not shrunk or doped.

Assembly: Glue the fin onto the exact center of the stab and check to be sure that it is vertical as viewed from the rear. After the fin has dried, the tail assembly may be glued onto the fuselage. For greatest strength, a small amount of tissue should be removed from the fuselage if the top has been covered, so that the glue can grip wood rather than paper.

Sand a small flat into the rear portion of the fuselage longeron so that the sub-fin can be solidly attached.

Glue the two wing panels together at the centerline, raising one tip 4" off the board for dihedral purposes. A block of wood can be used to hold the tip up while the glue joint dries, preferably overnight. When dry, add the wing mounts. The rear (short) mount glues on the underside of the wing trailing edge, while the front (tall) mount glues on the underside of the small cross-pieces just aft of the wing leading edge. After the mounts have dried, put a little extra glue into the crack along the bottom side of the wing dihedral joint.

The wing is held in place on the fuselage with two rubber bands. **CAUTION:** Do not

use excessively strong rubber bands, or the lower longeron may be broken. Only a small amount of tension is needed to hold the wing securely in position.

Flying: Check the wings and tail surfaces to be sure that they are not twisted. Happily, the nature of triangular planforms is such that warps do not cause as serious a problem as would the same amount of deflection on a normal wing design, but severe warps or twists should be eliminated.

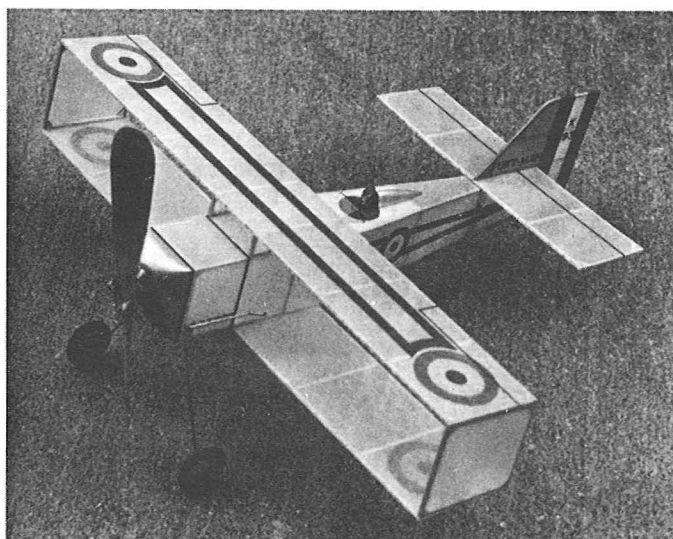
The power requirements of individual models vary, depending upon the choice of propeller, and the weight. Ours performed well on a single loop (two strands) of 1/8" flat brown rubber, but it is recommended that you try different sizes and brands until you arrive at the best combination for your particular aircraft.

Since the model is rather light, test flying should be performed on a calm day, and if possible, over a soft landing field of some sort. Even an ordinary lawn is more gentle to models than such unyielding surfaces as asphalt or concrete! When gently launched from shoulder height in a slight nose-down attitude, the model should neither dive nor stall. If it does dive, slide the wing forward on the fuselage. If the model stalls, slide the wing toward the tail. A 1/8" movement should be enough to make

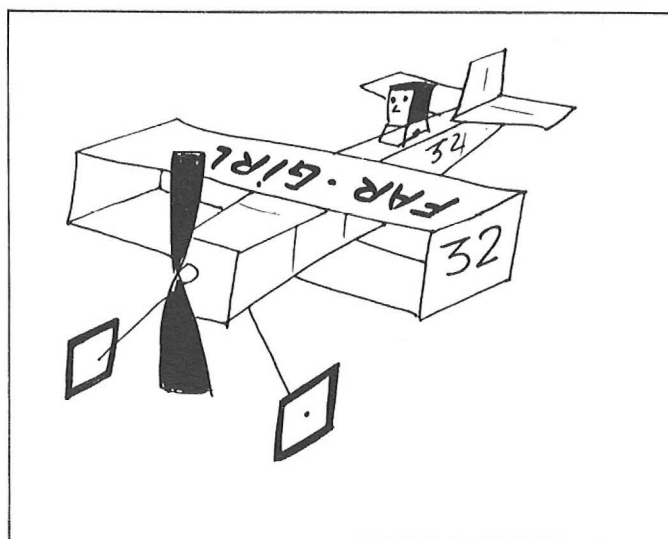
a noticeable difference. If the model tends to fall off on one wing, a simple cure is to affix a small lump of modeling clay to the opposite wing tip.

When a fair glide has been achieved, try winding in 50-60 turns of the prop and giving the model a gentle hand launch. It is likely that a little right-thrust may be needed. This is obtained by inserting a sliver of wood between the nose block and F1, so as to point the propeller slightly toward the right, as viewed from the rear of the model. Additional down-thrust might also be needed, and a sliver of wood at the top of the nose block will provide it. As power is increased, small changes in the wing position and/or thrust shims may be indicated. Perform only one adjustment at a time, so that you will know what not to do, if things get worse! Once your adjustments are just right, it is suggested that the thrust shims (if any) be glued permanently in place, and that a mark be drawn on the fuselage to record the best location of the wing. This is so that if the wing is shifted or dislodged, it can be returned to the correct position.

Remember to give "Delta Dan" part credit for your good flights—you can tell by his nose that he is a sharp pilot! ■



Sherman Gillespie decorated his FAR-MAN in British Hawker markings . . . transforming it into FURY-MAN.



"SQUARE IS BEAUTIFUL" according to Georges Chaulet, of Antony, France, who suggests this feminine type.

FAR-MAN

NOT SEMI-SCALE,
NOT EVEN ALMOST-
SCALE—THIS ONE IS
75% NON-SCALE!

• How about something different for a change? This easy-to-build little biplane is practically all straight lines. Notice that it has no dihedral and even the airfoils are simple flat surfaces. It is, of course, a quarter-scale model. By that we mean that it is three-quarters non-scale!

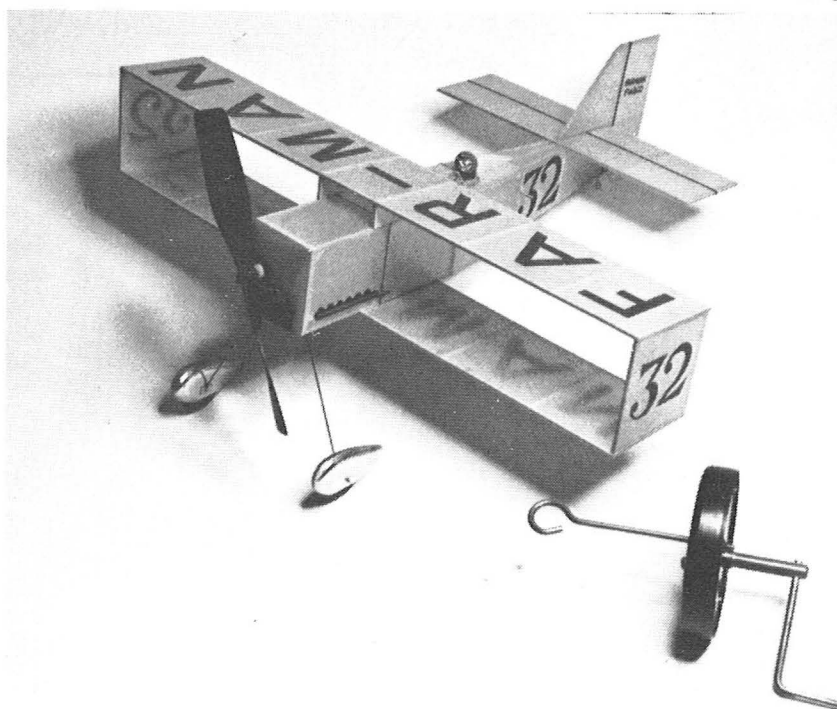
FAR-MAN is a descendant of the "Boxy Bipe" stick model that appeared in the February 1977 *Model Aviation* and the similar "Uncle Sam" Sig kit. But the inspiration for it goes much deeper into aviation history: About 1893, Lawrence Hargrave, an Englishman residing in Australia, invented the box kite, which gained stability through the use of vertical side curtains or closed "cells." Another Englishman, F.W. Lanchester, also experimented with vertical vanes for use as lateral stabilizing devices for model gliders during the 1900s. Full-size aircraft utilized the same principle in the form of "side curtains" between biplane wings. Notable examples were the Santos-Dumont 14-bis canard, which hedged the bet by also employing large amounts of dihedral, and some of the early Voisin biplanes, which relied solely upon side curtains for lateral stability. It was in this type of machine that Henri Farman did much of his early flying. Thus a sort of excuse for our play-on-words model name. If another justification may be needed, it might be found in the quotation of some wag who remarked that french curve drawing instruments were prohibited from the Farman factory, thus accounting for all the squarish aircraft from that firm!

In model form the vertical curtains eliminate the need for pesky dihedral joints and also make a great conversation piece at the local flying field. For some reason, the average model builder has great difficulty accepting the notion of a stable free-flight job without dihedral! As for the flat wings, the Shipp airfoil employed may surprise you with its efficiency and ease of building.

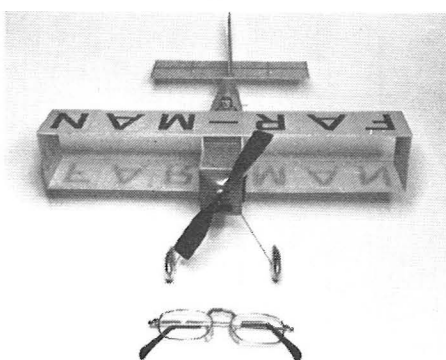
CONSTRUCTION. Splice the wing drawings as indicated and cover the plans with clear plastic wrap to protect them from glue. We build on a piece of insulation board, which will accept straight-pins easily without damage to one's fingers.

Select some medium-hard $\frac{1}{16}$ " square straight balsa strips which will compose most of the model's structure. By cutting the long pieces to size first, waste will be minimized. And when pinning the strips down, do not pierce the wood with pins, but rather use the pins on each side to form an "X" over the strip.

Fuselage. Construct a fuselage side directly over the grained portion of the

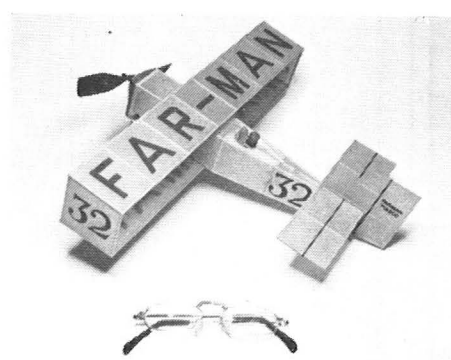


Not a scale "anything" but still reminiscent of aircraft flown in the early 1930s.



Box form and straight lines make this one a simple project; but one that flies well.

side-view drawing. When this is dry, the pins may be removed, another sheet of clear plastic wrap applied, and a second body side built directly atop the first. This will help to assure uniformity. When dry, remove from building board. Bevel the inner rear members as shown in the top-view drawing, and glue the sides together at the tail posts. Placing the assembly inverted over the top view may make alignment easier. Add the crosspieces, working from the rear forward. Check for squareness using a triangle or small cardboard rectangles. The sides should be carefully cut and cracked at the points where they become parallel, and reglued. Add the remaining crossmembers and sheet balsa in the cockpit area. The "pit" may be cut out or, if preferred, simply simulated with black tissue. Add the hard balsa



Vertical side curtains provide stability and eliminate need for any dihedral.

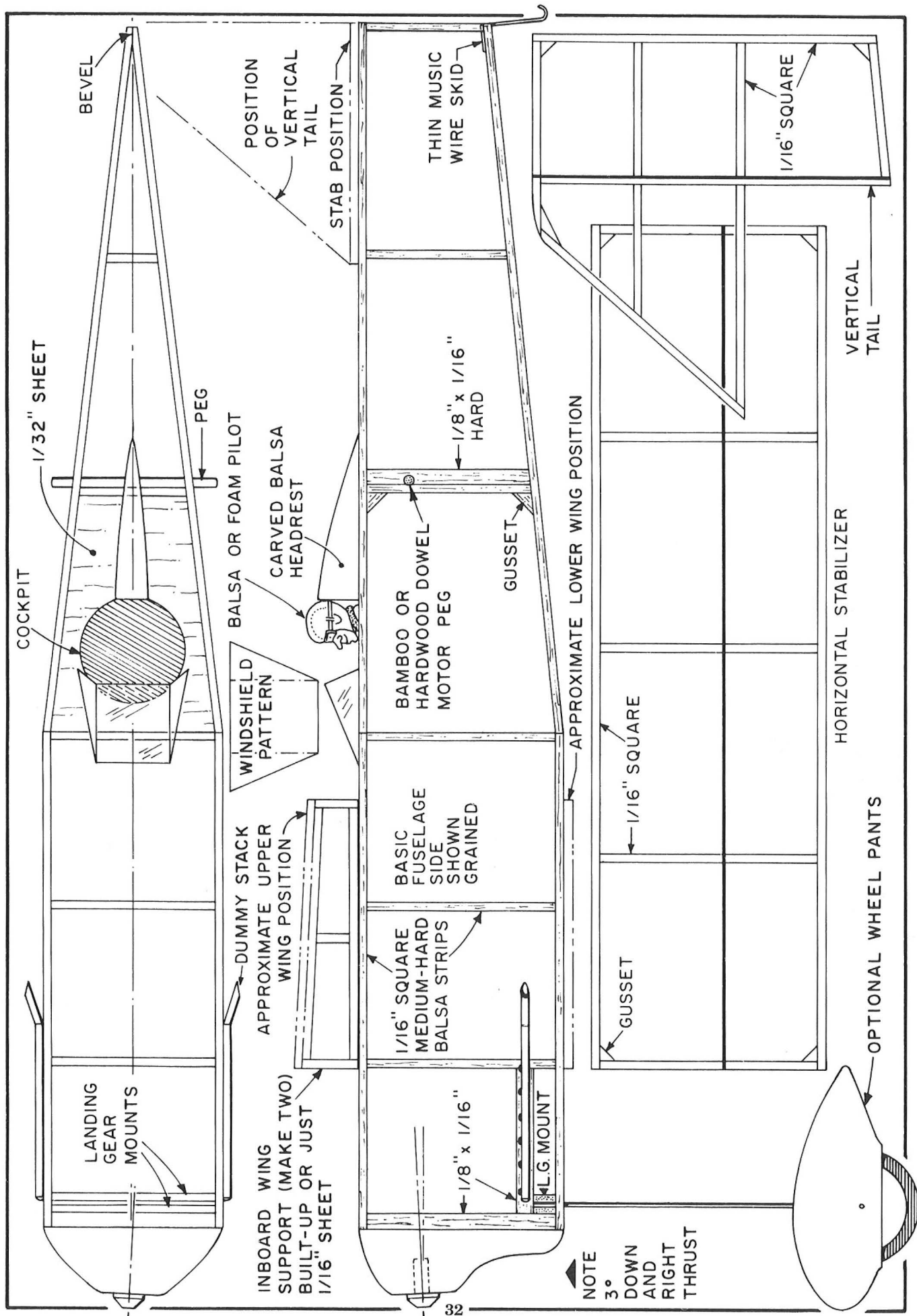
crossmembers for the landing gear mounting.

Wings. Both wings are alike, so they may be constructed one atop the other in the manner of fuselage sides, if desired. Be certain they have completely dried before removing them from the building board.

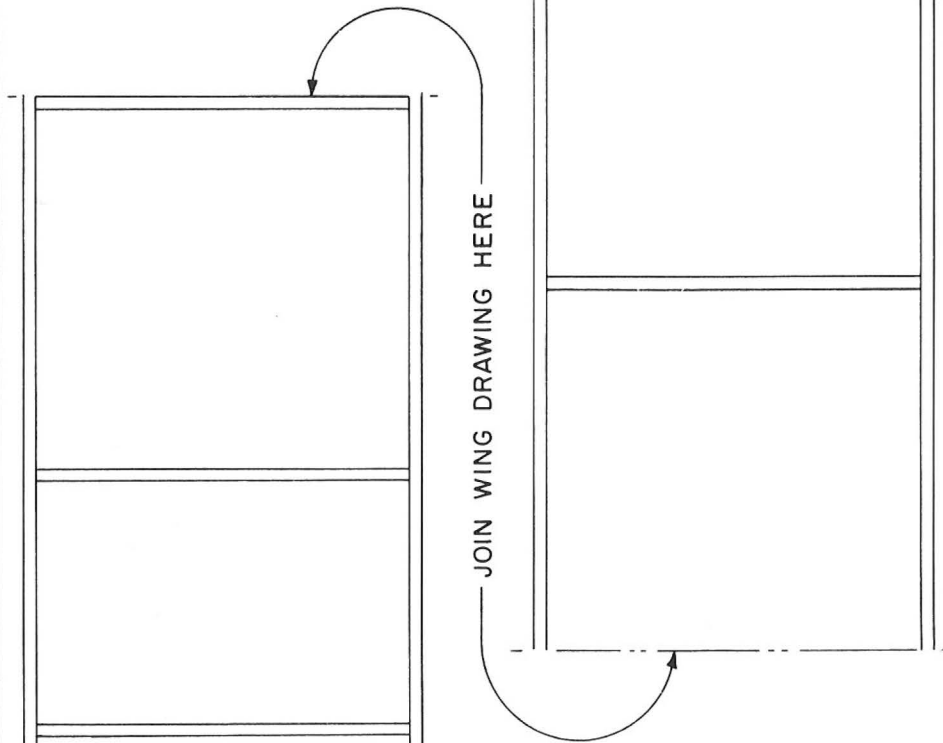
Tailplanes and side curtains. All these items are constructed in similar fashion from $\frac{1}{16}$ " square strips. The small triangular gussets, while not absolutely necessary, will help reduce wrinkles in the covering and add strength.

Covering. Check each joint carefully, and reglue any suspicious-looking junctures. Sandpaper any lumps or imprecise joints so that the covering will lie smoothly in position.

The fuselage is covered in the usual way and shrunk with rubbing alcohol rather



THIS IS A FULL-SIZE PLAN



THE
FAR-MAN
BY BILL HANNAN
"SQUARE IS BEAUTIFUL"
1980

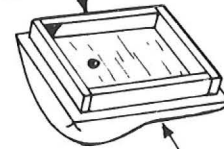
TOP AND BOTTOM WING STRUCTURES
ARE IDENTICAL.

1/16" SHEET LANDING GEAR
MOUNT (MAKE TWO)



WING "CURTAIN"
(MAKE TWO)

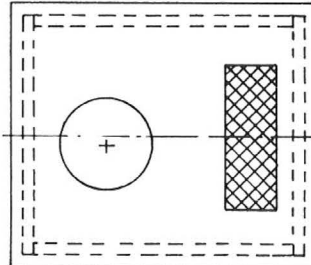
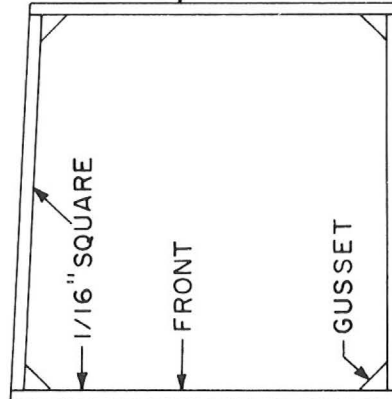
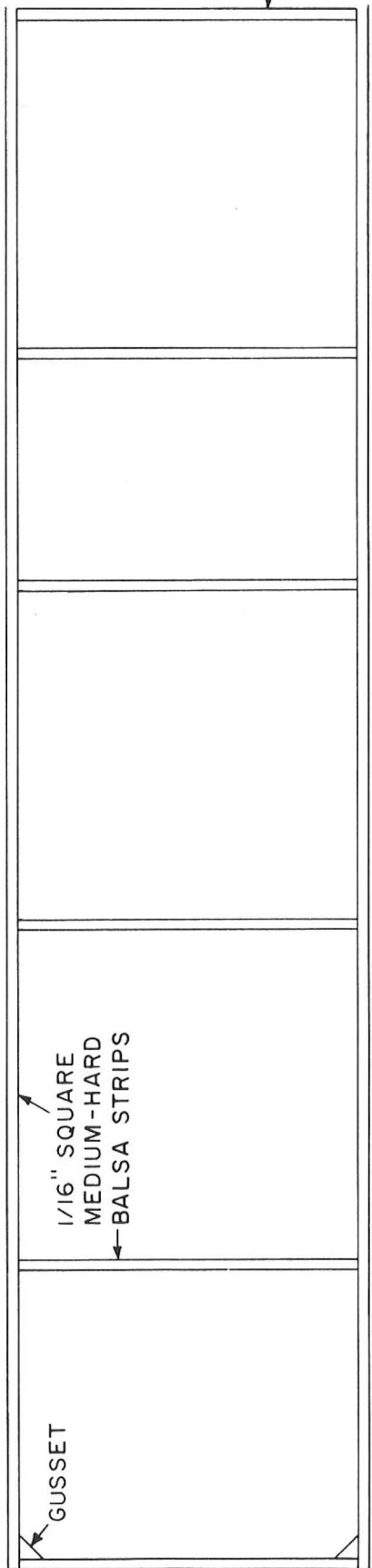
1/8" x 1/16"
HARD BALSA
STRIPS



1/32" DIAMETER
LANDING GEAR LEGS
(MUSIC WIRE)



WHEEL PANTS MAY BE
CONSTRUCTED FROM BALSA
OR VACUUM-FORMED PLASTIC



NOSE BLOCK
FRONT VIEW

TAPE RETAINS WHEEL PANTS

than water for a milder shrinking action, then two thin coats of Sig Lite-Coat clear are applied.

The wings, tailplanes, side curtains, and inboard wing supports are approached somewhat differently. Note that they may be covered one side only (lighter and better performance) or both sides (improved appearance and possibly greater warp resistance). The choice is yours.

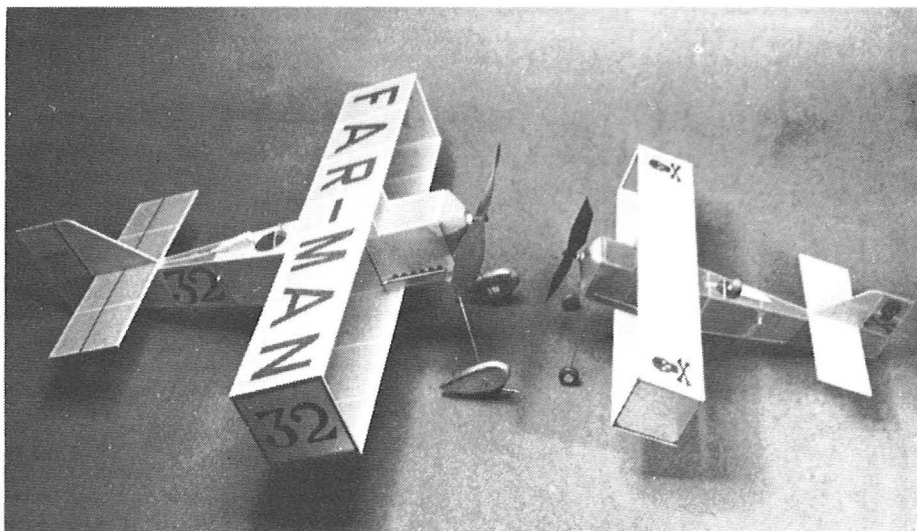
To cover these items in a manner that will minimize the chance of warping, first build a sort of "picture frame" from scrap wood strips, say, $\frac{1}{2}$ " square. Assemble the strips into a rectangular frame about 8" x 14" or so. Apply tissue to this using your preferred adhesive, and shrink with rubbing alcohol or water mist. Being preshrunk, the paper will be less inclined to generate warps when used to cover the flat model parts. The parts may be applied to the tissue, rather than vice versa, while the tissue is still attached to the picture frame. We generally use water-thinned white glue for this purpose, applying it sparingly so that it does not promote warping. Ol' debil warps are hiding everywhere! After the glue has dried, simply slice the parts free from the surrounding tissue with a sharp blade, and repeat as necessary.

We did not apply dope to our wings, side curtains, or tailplanes, but it may be prudent in humid climates. In such a case, we suggest supporting the flat surfaces in simple jigs while the thinned Lite-Coat dries.

Nose block. The nose block may be carved from block balsa or laminated from sheet stock to the required thickness. Its shape is purely arbitrary and you may prefer a different configuration to suit your own taste. Obviously, streamlining was not our chief motivation! Be certain that the portion of the nose block that fits into the fuselage is a snug fit. It must be removable for winding, but tight enough that it will stay in place after the rubber motor runs down. The Peck-Polymers nylon thrust bearing should be installed at about 3 degrees down and right thrust angles.

Landing gear. Bend the landing gear legs from music wire as shown on the plans. The upper portion should be a close fit between the fuselage landing gear mounts. Do not install yet, however. The wheels may be any kind in the $\frac{3}{4}$ " to $1\frac{1}{4}$ " diameter range. We went "whole hog" with Hungerford spoked wheels, but plastic or wooden ones will serve admirably. The wheel pants are optional and a bother to make, but do add a bit of flair to the otherwise square appearance of the bird. The pants may be built up from sheet balsa and carved to shape, or vacuum-formed in halves over carved wood forms. Ours were secured to the landing gear legs with thin strips of tape. Bend and install the thin music wire tail skid.

Decor. Although the model will perform without decorations, they are "frosting on the cake" and will repay the extra time



Reduced version of the Far-Man biplane, was constructed directly over plan that had been reduced to $9\frac{1}{4}$ " span via an inexpensive Xerox reduction process. Flies well on $\frac{4}{16}$ " Skeeter prop; markings from Comet kit.

spent in applying them. The prototype model featured black tissue markings on its orange covering, but why not exercise your personal creativity in choosing color and markings? Thought starter: Remember the Japanese entry in the movie "Those Magnificent Men in Their Flying Machines"? It featured vertical wing curtains emblazoned with fire-breathing lions!

ASSEMBLY. Glue the stabilizer in position, being careful that it is properly aligned as viewed from the top and the rear. The vertical tail may then be added and checked for "squareness."

Place the upper wing upside down on your building board. Glue the inboard wing supports onto it, and then add the outboard curtains, being certain they are in correct relationship to the inboard supports, since this is how the wing incidence is established. The curtains may be supported with small bottles or blocks while they dry. Cement the lower wing to the outboard curtains and allow to dry thoroughly. The wing assembly may now be slid onto the fuselage, but do not glue in place yet.

Insert the landing gear legs into the fuselage slot, securing in position with thick glue or 5-minute epoxy.

Install the propeller shaft, thrust washers, and plastic propeller, and insert nose block assembly into the fuselage front.

With everything in place, balance the model. When the balance point has been found, mark it with a soft pencil or pen on the lower fuselage longeron. Measure approximately $\frac{3}{8}$ " forward of the balance mark and locate the lower wing leading edge at that point. Two options are now open to you: (1) The wing may be glued solidly in position and any final adjustments to balance achieved by adding clay ballast as indicated by flight-testing, or (2) the wing assembly may be lightly spot-glued in place, to be shifted if flight tests

reveal balance problems.

FLYING. Check that all surfaces are warp-free, especially the wings and stabilizer.

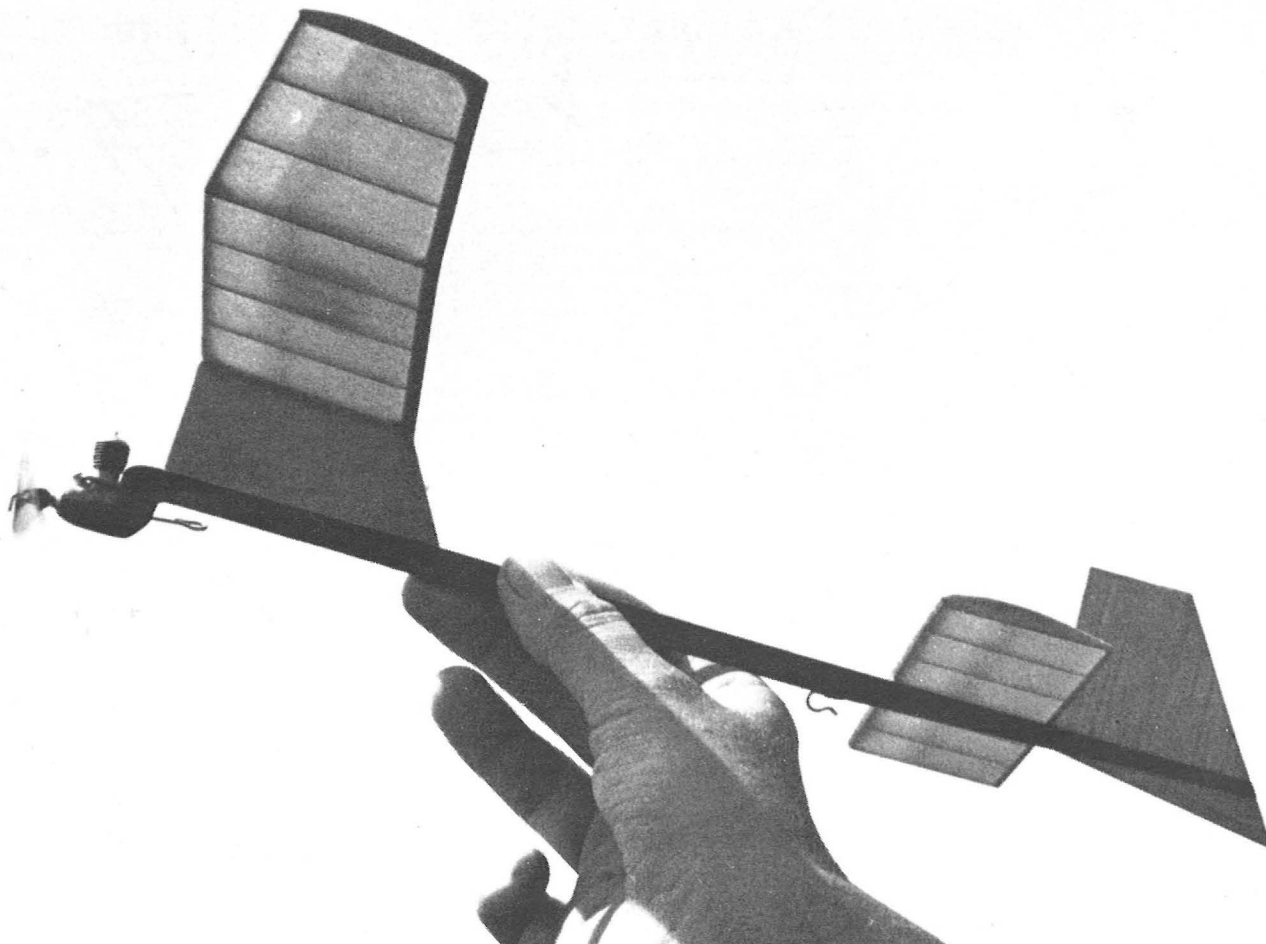
The original model was flown with a $5\frac{1}{2}$ " diameter North Pacific "Sleek Streak" plastic propeller, but other similar units in the 5" to 6" size range would probably work.

The original could be flown in a fairly docile manner with $\frac{1}{8}$ " rubber, or in a more spirited fashion with $\frac{3}{16}$ ".

It is safest to try any new model over a soft surface, such as grass or weeds, and without wind interference. Try gliding the model in a slight nose-down attitude. It should descend in a fairly straight and smooth manner to the ground. If it stalls, stuff a little modeling clay inside the nose block. Alternatively, if you have elected to spot-glue the wing assembly in place, the balance may be adjusted by loosening the glue joints and moving the wing slightly aft to stop stalling, or forward to stop diving.

If the model swerves consistently to one side or "falls off on one wing," a little gentle rudder-bending may help. In extreme cases, try adding a small lump of clay to a wing tip opposite the offending turn.

Next, try a few hand-wound turns in the rubber motor, about 50 or 75, and launch. If a reasonable flight path results, try about 150 or so turns and relaunch. If model stalls under power increase, insert a thin balsa shim to tip the top of the nose block forward a tiny amount (down-thrust). A very slight stall may sometimes be cured by using a shim to provide side-thrust change. The prototype seems happiest flying in a sweeping left-hand circle. Incidentally, a rather strange "skidding" effect in turns is normal for aircraft with side curtains, and is no cause for concern. An interesting simile may be mentioned concerning the turning attitudes of flat-bottomed versus "Vee" bottomed motor-boats.



Here we see the FAI Peanut with dummy power plant and without the real motivation suspended between the front and rear rubber hooks.

FAI Peanut

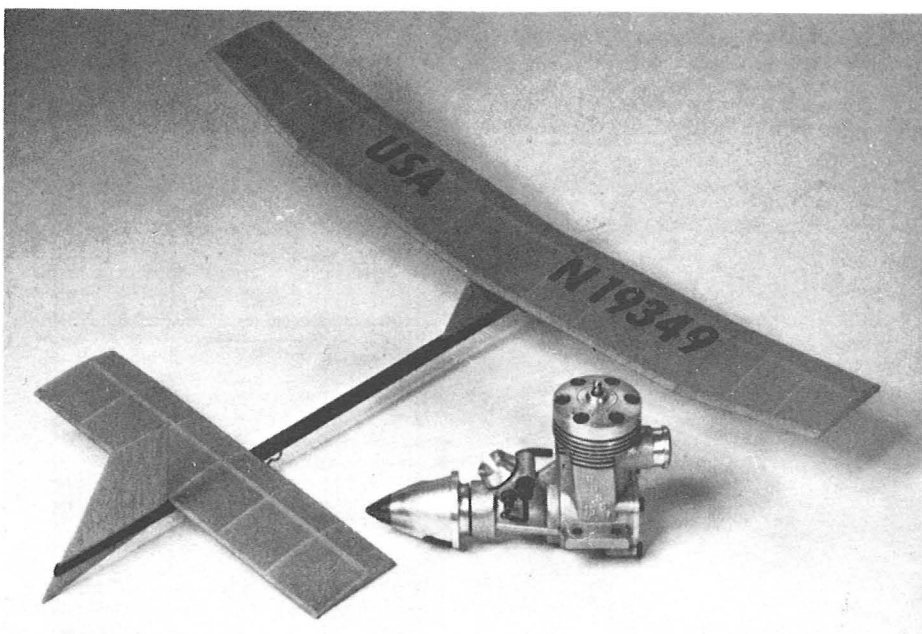
How about this switch—a model of a model? Here is a fine outdoor rubber-powered version of an FAI Power bird.

BY WILLIAM HANNAN

- How about a model of a model? Back in May, 1954, an article called "Models of Models," written by Paul Gilliam appeared in *Model Airplane News*. Included were photos and full-sized plans for tiny gliders resembling larger "gas" models. During a visit with Bill Krecek, we had an opportunity to see one of these delightful models firsthand, which gave us the idea for a similar, but powered form of mini-model.

Our example was not intended to represent any specific design, but using the basic ideas, one could build a miniature version of almost any FAI or competition-type Free Flight model. Our main objectives were simplicity, low cost and reasonable realism. It would be quite feasible to construct a more nearly "scale" fuselage, which could contain the rubber motor, but we chose the direct (easier!) motor stick approach. Only a minimum of materials is required, many of which can probably be found in your scrap box.

FUSELAGE. Select a light, but firm, piece of $\frac{1}{4}$ " x $\frac{1}{8}$ " balsa for the motor stick and cut it to the shape shown on the plans. Starting at the rear rubber retainer hook, taper the fuselage gradually to meet the $\frac{1}{32}$ " thickness of the fin, as viewed from the top.



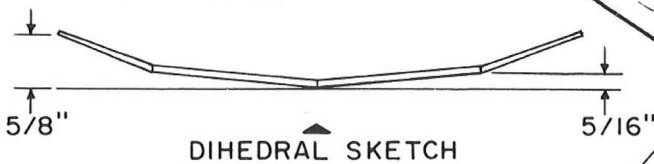
Comparison of relative size is seen here with a front rotor, .15-sized Rossi engine.

GUSSET
(TYPICAL,
WING AND
STAB)

FAI PEANUT

BY BILL HANNAN

THANKS TO:
BOB PECK (PHOTO)
BILL KRECEK (IDEAS)
BRUCE HANNAH (ENGINE
LOAN FOR PHOTOS)



FIN

1/32" SHEET

SUB-FIN

USE 4" D.
KAYSUN PROP

ALL WOOD
IS BALSA

R4 1/32" SHEET
(MAKE TWO)

STABILIZER
POSITION

R3 1/32" SHEET
(MAKE TWO)

THREAD

R2 1/32" SHEET
(MAKE TWO)

REAR
HOOK
.025 D.
MUSIC
WIRE

R1 1/32" SHEET
(MAKE TEN)

STARBOARD WING HALF
OPPOSITE SHOWN DOTTED

FUSELAGE
1/4" x 1/8"

WING MOUNT
TRIANGULAR
SIDE PIECES

STABILIZER

DIHEDRAL
BREAK

STABILIZER RIB
1/32" SHEET
(MAKE SIX)
1/16" SHEET
(MAKE ONE)

TRIANGULAR
SIDE PIECE

BALANCE
POINT

PYLON CROSS-SECTION

LEADING
EDGE
1/16" SQ.

SPAR
1/16" SQ.

GLOW PLUG
HEAD

FUSELAGE

CYLINDER
NEEDLE
VALVE

INTAKE

SIDE
PLATE

SHAFT
.032 D.
MUSIC
WIRE

FUEL
LINE

THRUST
BEARING

CRANKCASE

1/16"
SIDE
PLATE

WASHERS

DUMMY ENGINE (SEE ARTICLE)

PYLON
3/32"

THRUST
4° DOWN
3° LEFT

1/8" x 1/16"
TRAILING
EDGE

Cut the pylon to shape from 3/32" sheet, noting the direction of the grain shown.

Add a small, triangular strip of balsa to each side at the top to form a saddle for wing support. Glue the pylon to the fuselage, centering it carefully. The fuselage and pylon may be covered with colored tissue or given two thinned coats of color dope.

WING. Cover the plan with clear plastic wrap to protect it from glue. The wing is constructed in two panels, one of which is indicated on the plans in dotted lines. Cut out the various wing ribs as noted. Pin the 1/8" x 1/16" trailing edge to the board and glue the ribs against it.

Next, add the 1/16" square leading edge. When this assembly has dried, cut the leading and trailing edges at the dihedral break. Sand the cut edges at an angle to fit correctly against the rib when the tip is raised 5/16" for dihedral, and glue in position. Next add the 1/16" square spar.

Repeat for opposite wing panel. Using a sandpaper stick or an emery board, taper the trailing edges and blend all parts into a smooth contour. Loosen one root rib so that it may be angled slightly for the center dihedral. Glue the two panels together, propped up for dihedral as indicated on the plans.

When dry, add the triangular reinforcing gussets. Cover the wing with lightweight, colored tissue and shrink the covering with rubbing alcohol rather than water, to minimize the chance of warping. Finally, apply a thinned plasticized clear dope, such as Sig Litecoat.

The rules for "real" FAI ships specify that if the model is to be flown outside the U.S., an "N" must appear before the license number on the wing. If the parts are demountable, the numbers are also required on the stabilizer and fuselage. Since our little bird is not demountable (not intentionally, anyhow!) we need the I.D. markings only on the wing, in a contrasting color of tissue.

TAIL PLANES. The stabilizer is constructed and covered in similar fashion to the wing, using very lightweight balsa. The fin and sub-fin are cut to shape from light 1/32" sheet. Note the direction of grain on each part. The fin and sub-fin may be covered with colored tissue or painted with thin color dope.

ENGINE. This is the one item that deserves a little extra patience and care, but the compliments received from fellow modelers will be ample reward for the effort spent. We decided that as long as we were designing our own model, we would design our own engine, but you may prefer to simulate an actual power plant, such as a Rossi or Supertigre.

An exact reproduction is not necessary—only a reasonable facsimile. Of course, if you are a real nit-picker, here's your chance to prove it!

Our engine was constructed as follows: First, a Williams Bros. 1/2" scale universal dummy cylinder was reduced in height by cutting off the top four cooling fins. Next, a cylinder head was made from scrap plastic. Plastic was chosen for ease of gluing (with plastic cement), but other materials could be used with a different adhesive, such as contact cement.

The dummy glow plug base is scrap plastic, while the remainder of it is a small straight pin with the head reduced to a tiny ball. This is done by chucking it in an electric drill and letting it revolve against a smooth file.

If desired, an exhaust stack may be fabricated and cemented to the cylinder, but we simply cut a slot to represent an exhaust port. Opposite the exhaust, a dummy bypass bulge may be added if desired.

The engine crankcase and mounting pan can be carved from a single block of medium-hard balsa, or they can be carved separately and glued together. A hole to accept the cylinder can be drilled with a sharpened piece of brass or aluminum tubing. This should be done before carving the crankcase shape, to minimize chances of splitting the wood.

Next, the case is drilled to accept the Peck-Polymers nylon thrust bearing. As an alternative, a section of 1/16" diameter aluminum tubing may be used. Important: Note down thrust and left thrust angles! (Most rubber-powered models employ right thrust, but not this one.) Roughen the outside of the thrust bearing with a file so that glue or epoxy can get a good grip to hold it securely in the crankcase.

Finally, carve and sand the crankcase and engine mounting pan to final shape. The little engine mounting lugs can be carved integrally or added as separate parts.

Drill a hole in the crankcase for the aluminum tubing intake. Ours was simply flared to shape by forcing a tapered punch into the end of the 1/16" diameter tube. The intake was not glued in position until after the painting was completed. Apply several coats of primer to the crankcase, sanding and priming until the grain is filled.

We suggest using flat, plastic model paints, which are available in small, inexpensive bottles. Flat colors are far more realistic in appearance than the glossies, which seem to take ages to dry and look sticky even after they do.

If you are modeling a particular engine, study photographs of it. Note that some magazine advertisements are useful for this. Different brands vary a great deal in surface finish. Some are rather rough-cast looking, while others glimmer like fine jewelry. In simulating a particular engine, capturing this rather elusive character is all-important.

In the actual engines, this appearance is partly the result of different materials, such as aluminum, steel and various alloys. The way in which these materials are finished also affects the appearance. Some parts are left "as cast"; others are polished or sandblasted; while still others may be color-anodized. Seldom, if ever, are parts as highly reflective as chrome, which is why excessively shiny paints look unrealistic.

For our engine, we chose Pactra "steel" paint for the crankcase and lower cylinder barrel. The cylinder fins were lightly dry-brushed with this same color, but the inner areas between the fins were left natural black to create greater visual depth. The cylinder head was painted flat aluminum, while the intake tube was left its natural color.

The needle valve was bent to shape from a piece of thin wire and inserted through tiny, drilled holes in the intake pipe. Small diameter "spaghetti" tubing or the insulation from small gauge electrical wire represents the fuel line.

MISCELLANEOUS. Bend the propeller shaft and rear hook to shape from music wire, as indicated. FAI models usually employ a single-wire landing skid, which may be added if desired.

Although other brands of plastic propellers might be used, we selected a 4"-diameter Kaysun. Since this type does not feature a free-wheeler, we

carved one into the hub. If you prefer, a better one can be made from brass tubing, epoxied to the propeller hub.

ASSEMBLY. File the end of the rear hook to roughen it and insert in fuselage stick, securing with a generous coat of glue or epoxy. Glue the engine assembly into the fuselage, taking care that it is aligned for correct thrust angles, and add the side reinforcing plates.

Scrape the tissue off the center ribs of the wing and stab where they will mount, and glue them in position. Check alignment as viewed from both the top and front before the glue dries. Add the fin and sub-fin.

Install the propeller shaft, thrust washers and propeller. A tiny drop of oil applied to the thrust washers will reduce friction.

FLYING. Check model carefully for warps. If any are found, correct them over a steaming teakettle. The model should balance, without rubber, at about the point indicated on the side view. Add a short loop of 2mm. or 1/8" rubber for the initial test, which should be performed on a calm day over a soft surface, such as tall grass. Glide the model from shoulder height and correct any stalling or diving tendencies with nose or tail ballast.

Next, try about 40 or 50 turns of the propeller. If model turns too sharply to one side, add a small amount of clay ballast to the opposite wing tip and repeat tests. Gradually increase number of turns and readjust if necessary. When all is well, change to a longer, lubed loop of rubber and use a winder.

Flyers of full-sized FAI models use a bewildering "bag of tricks" in adjusting their models, including stabilizer tilt, thrust line offsets, washin, washout, etc.—not to mention such gadgetry as auto-rudders and variable incidence tail planes. In our case, we tried to keep things simple, using only ballast changes for adjustments. This can be very educational.

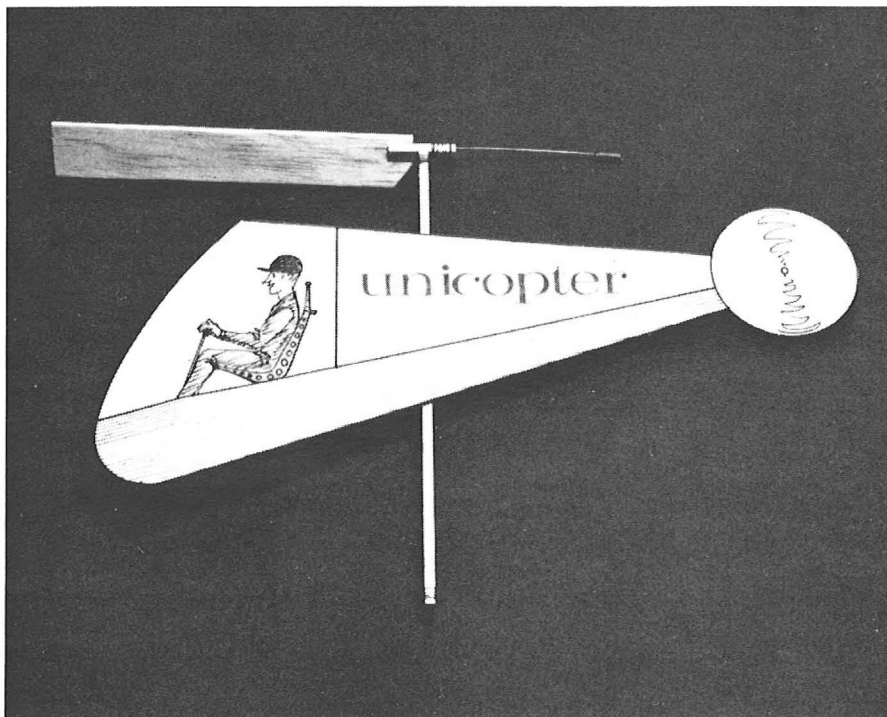
For example, by shifting the balance to the rear just the right amount, descents after the power runs out can be made in a manner very similar to a model with a dethermalizer in action. Ballast adjustments also have another advantage. If you goof, you can easily return the model to its original condition; whereas other adjustment methods, such as wing tip and tail plane bending, are difficult to "undo" in any exacting manner.

Now then, how about trying a mini-model of an actual FAI ship? Three-view drawings and descriptions of such designs have appeared in past issues of *Model Airplane News*, especially in Dave Linstrum's "VTO" column. And speaking of "VTO," with enough power, our model will perform this type of takeoff with ease! One of the fun things about these tiny models is the effect of perspective. Even at moderate altitude, they appear to be high in the sky. ■

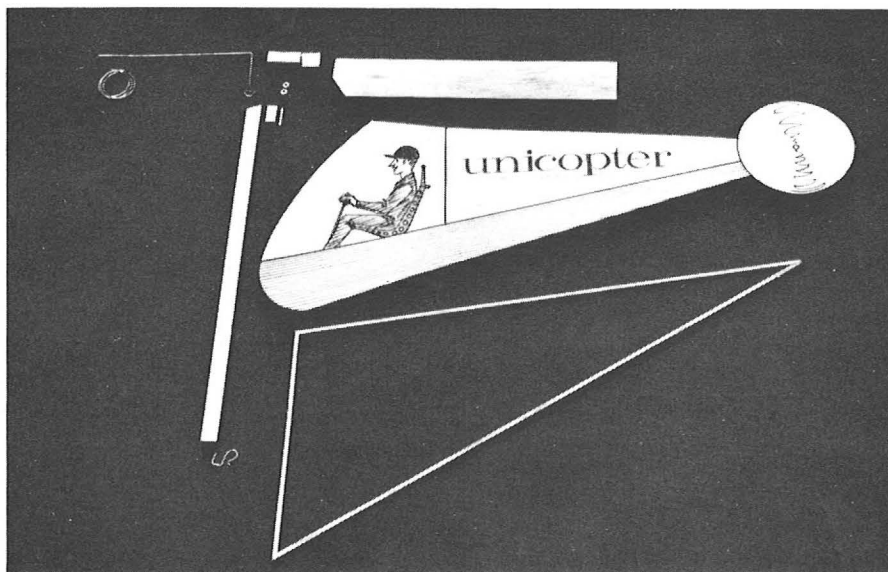
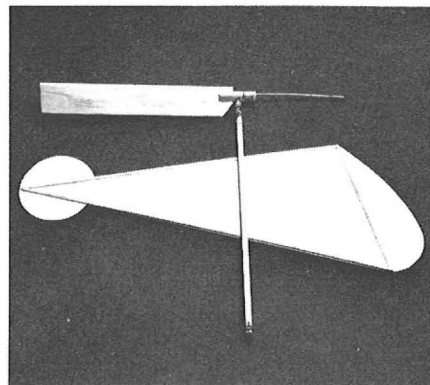
The late, great
Carl Goldberg and
"model of a model."



UNICOPTER



Right: Back side can be decorated by copying the lines from the front side to the back. Don't copy the words, they would only come out backwards! Below: For a helicopter, what could be simpler? Body rotates a little in flight. Well, actually a lot!



Helicopters are among the oldest of flying machines—at least in idea form. Leonardo da Vinci was doodling designs for them back in the 15th century. Yet, even today, helicopters remain much misunderstood, and only very recently have successful radio-control models of them been developed.

Our miniature 'copter was designed to provide maximum fun for a minimum investment in time and materials, but will still offer the chance to explore the problems associated with rotating-wing aircraft.

CONSTRUCTION

Begin construction by building the triangular fuselage framework from fairly hard $1/16''$ square balsa strips. A sheet of waxed paper will keep the sticks from adhering to the plan while the glue is drying.

The fuselage covering may be cut directly from the magazine, or if you like to preserve your AAMs, make a tracing of it on thin paper. Glue the triangular frame to the back of the fuselage covering, and apply a few weights to hold the assembly flat while it dries.

Next, cut the motor stick to length from a strip of $1/4 \times 1/8''$ balsa of medium weight. Cut the angle on the top end, and glue on the little bearing spacer piece, which may be cut to size from leftover motor stick stock.

Bend the lower motor hook to shape from $1/32''$ dia. music wire and bind in place with sewing thread and glue. The rotor shaft bearing is cut from a length of $1/16''$ OD aluminum tubing by rolling a single-edge razor blade over it. Snap the tubing along the scored line, and sandpaper or file off any rough edges. The bearing is secured to the motor stick with thread and glue.

The completed motor stick may next be glued to the fuselage framework in the position shown on the plans.

The rotor is cut to size from a piece of medium-hard $3/32''$ sheet balsa. Sand it to an airfoil shape with a sanding block. A general cross-section is shown on the drawing, but the exact shape does not seem to be critical.

The rotor hub is made from a *hard* piece of $3/32''$ sheet. Carefully cut away one corner to accept the rotor blade. Drill a hole in the hub center for the rotor shaft, being careful that it is "square" with the face of the hub, so that it will run true.

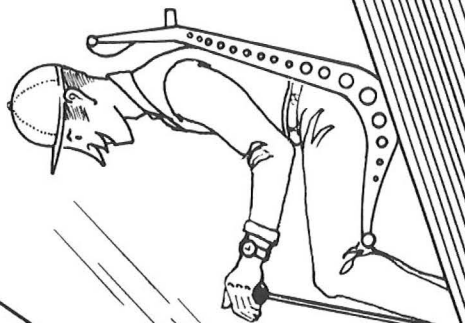
A length of $1/32''$ dia. music wire is used for the rotor shaft. First, bend the hook end to shape. Next, slide the shaft through the rotor shaft bearing, add a couple of brass thrust washers, and the rotor hub. Using the drawing as a guide, make the right-angle bend in the shaft above the rotor hub, and also at the extreme end of the wire. This small bend serves to help retain the rotor

balance weight. Using sewing thread and glue, bind the shaft arm to the rotor hub.

The rotor may now be glued onto the hub. Obtain a length of electrical solder, and wind it neatly onto the balance end of the rotor shaft. Hold the motor stick horizontally, and you will be able to determine the static balance by trial and error. A thin coat of glue will keep the solder in place.

And there you have it! Power on our model was provided by a single loop (two strands) of 1/8" flat Pirelli rubber. With limited winds, the model may be flown indoors. With more power, the Unicopter can reach surprising altitude outside. After winding, release the rotor a moment before letting go of the lower motor stick. In some cases, stability may be improved by adding a small amount of solder or clay to the bottom of the motor stick. For maximum performance, lube the rubber and stretch wind with a mechanical winder.

Once you have constructed and flown the basic Unicopter, you may wish to try a few experiments. For example, in theory, the rotor counterbalance arm should be bent slightly downward and forward to provide better dynamic balance. Then too, the addition or subtraction of weight in small amounts may contribute to reducing vibration. This is easy to test by holding the model loosely by the base of the motor stick, where vibration effects can be both seen and felt. ■



Unicopter

TRACE COPY ONTO THIN PAPER

COLOR WITH FELT POINT PENS

FULL SIZE PLANS

Unicopter!

ULTRA-SIMPLE RIGID ROTOR HELICOPTER

BY BILL HANNAN

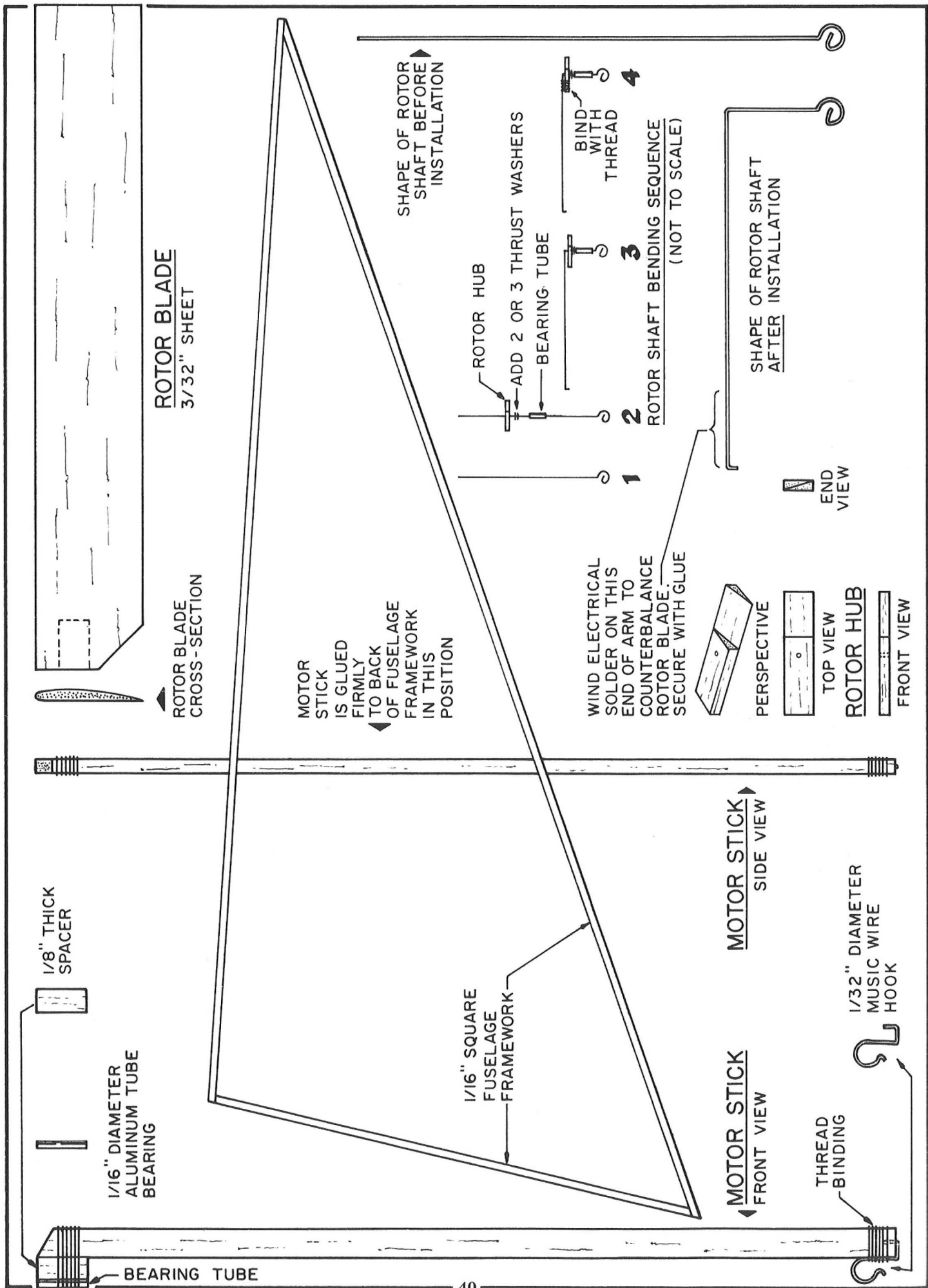
ALL WOODEN PARTS ARE BALSA
POWER: ONE LOOP 1/8" PIRELLI

You might also care to experiment with different rotor lengths, areas and thicknesses. Additionally, different sizes of rubber motors may be tried. A great deal can be learned very quickly in this manner, which could prove useful on more sophisticated model helicopters. Happy hovering!

JUST FOR FUN:

AFTER BUILDING AND FLYING UNICOPTER, TRY THESE EXPERIMENTS:

1. ADD MORE POWER
2. REDUCE ROTOR BLADE PITCH
3. INCREASE ROTOR BLADE PITCH
4. TRY LONGER AND SHORTER BLADES



MONOCOPTER

Simple, single-rotor design that flies...and flies!

By Bill Hannan

BUILDING A Monocopter can offer hours of free flight fun with little investment in time or materials.

This helicopter is simple, with only one rotor blade and no belts, pulleys, or other intricate parts.

Although it is a profile design of the Italian Agusta A-109 Twin, it can be built with another design if the layout is similar.

Before building, make a copy of the plans to preserve the originals, and when selecting materials, remember that weight is a performance enemy in any aircraft, but especially in helicopters.

CONSTRUCTION. Cut the Monocopter's motor stick from a stiff, medium-hard strip of $\frac{3}{16} \times \frac{1}{8}$ inch balsa. Glue a short section of balsa to one end to act as a spacer for the rotor-shaft bearing.

The bearing is a section of $\frac{1}{16}$ -inch diameter aluminum tubing. Cut it to length by rolling it under a single-edge razor blade, then snapping the tube along the scored line. Smooth the end with a fine file and sandpaper.

A Peck-Polymers nylon thrust bearing can also be used. For either tube bearing, roughen the outside for better glue adhesion.

Bend the rubber-motor retaining hook from thin music wire, then roughen it and insert it in the lower end of the motor stick. Wrap both the rotor-shaft bearing and retaining hook with strong thread and secure them with glue.

Glue the fuselage, which consists of $\frac{1}{16}$ and $\frac{1}{8} \times \frac{1}{16}$ inch strips. Pin the strips in position while the glue dries.

Cut the fuselage covering directly from the plans. Apply color with fiber-point pens. My Agusta was white with red ornamentation.

ROTOR. Cut the rotor hub from hard



Meredith Lueken puts the rotor in motion, ready to launch the Monocopter.

$\frac{3}{32}$ -inch sheet balsa. Drill a small hole for the rotor shaft. Make sure it is square with the hub so the rotor will run true. Carefully cut away one corner to form the mounting face for the rotor blade. Use $\frac{1}{32}$ -inch diameter music wire for the rotor shaft. Make the bends in proper sequence, forming the hook for the rubber motor first.

Next, slide the shaft through the motor stick bearing, and add brass or teflon thrust washers, then the rotor hub. Make a right-angle bend in the shaft above the hub using the plans as a guide. Make another right-angle bend in the end of the shaft arm to help retain the counterbalancing weight. Bind the shaft arm to

the rotor hub with thread and glue.

Shape the rotor blade from $\frac{3}{32}$ -inch sheet balsa. An exact airfoil is not critical, but a suggested section is shown. The model will perform without washout but twist some in to give the blade tip less incidence than the root.

ASSEMBLY. Make the counterbalance from a length of electrical solder evenly wound onto the end of the rotor shaft arm. Adjust the balance horizontally. A drop of glue will secure the solder in position.

Glue the fuselage framework to the back of the fuselage covering and weigh it down to prevent warping.

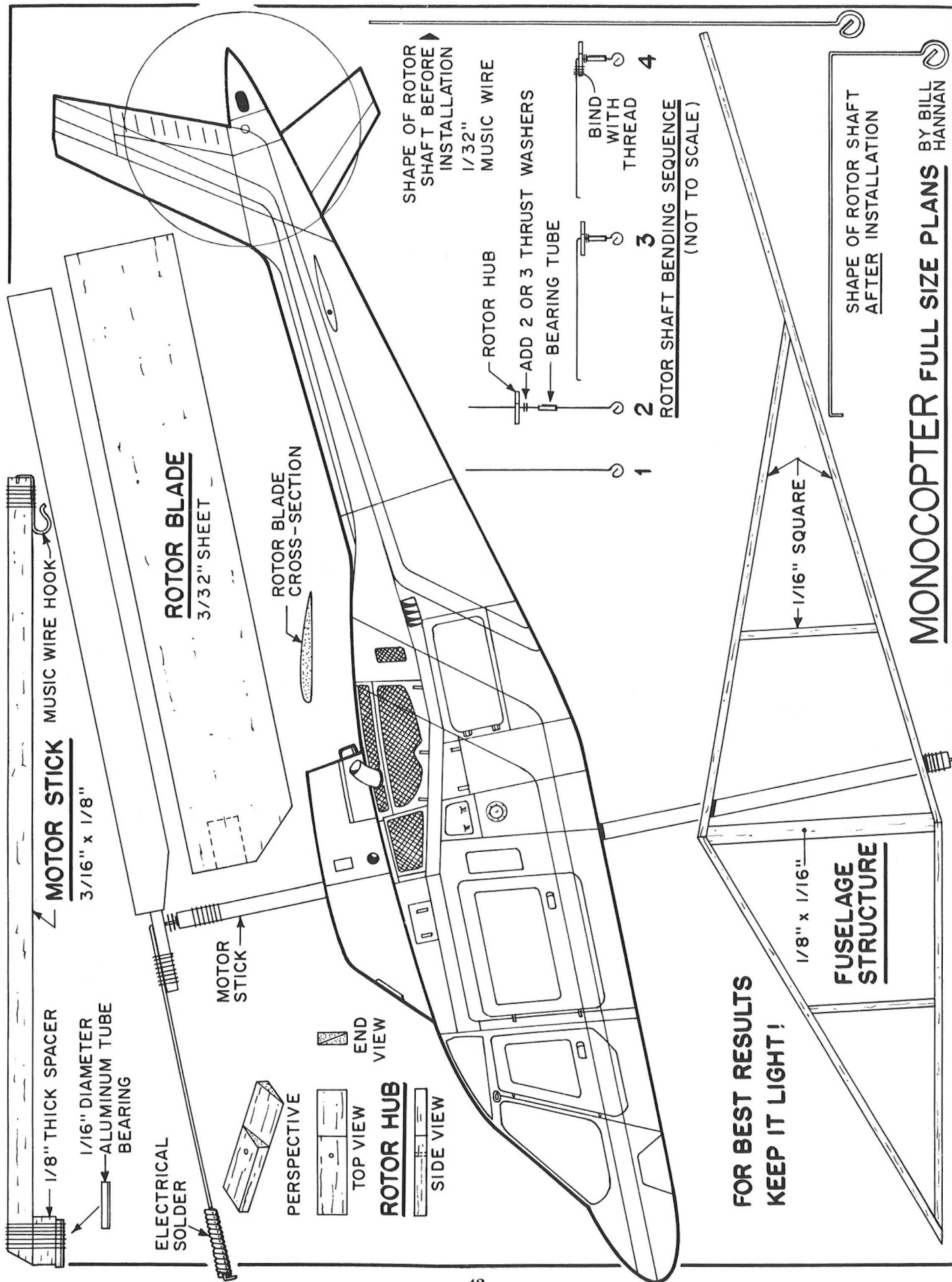
Then glue the motor stick firmly to the $\frac{1}{8} \times \frac{1}{16}$ inch portion of the fuselage framework. Moving the fuselage position up or down relative to the motor stick will alter the model's flight path.

FLYING. Add a drop of oil to the rotor bearings. Power requirements will depend on your model's weight and testing site. With low power the model can be flown in a fairly small room. Too much power can cause the Monocopter to hit the ceiling. Start with a single loop of 2 mm rubber.

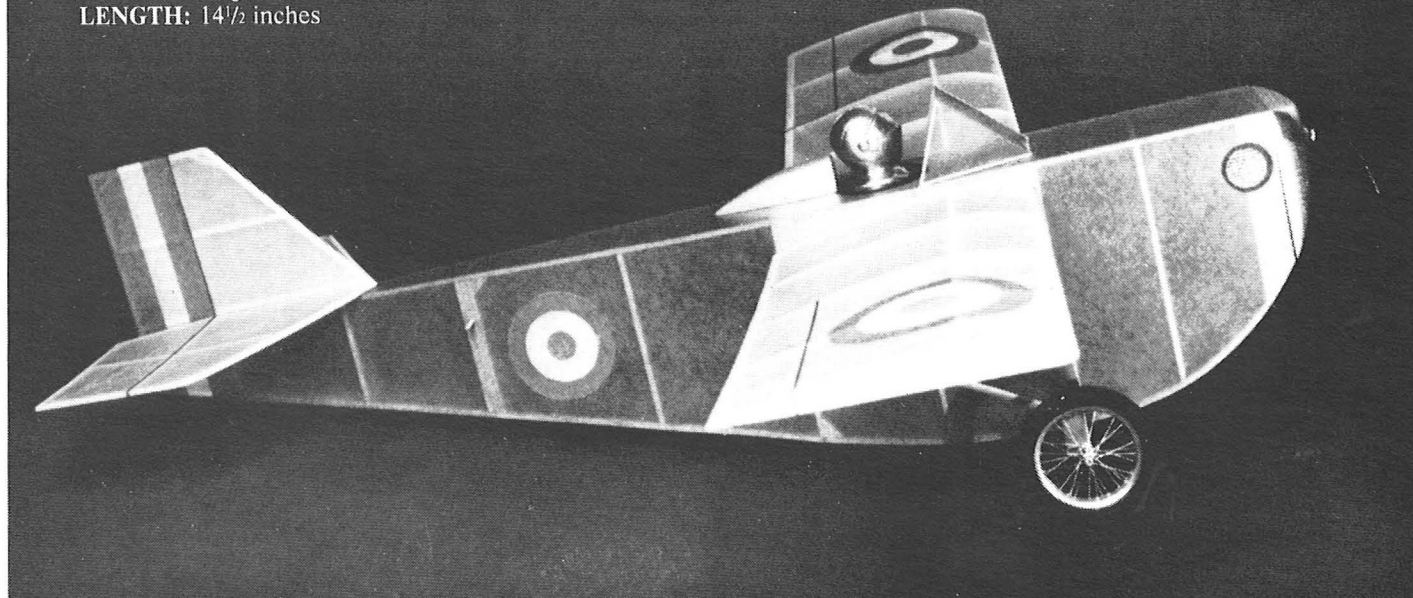
A long loop of lubed rubber winder-wound can yield impressive results in a large indoor site. During the recent West Baden indoor championships, Charles Sotich proxy-flew a Monocopter 80-feet high for over 40 seconds. Outdoors, with more power, the model can fly much higher.

EXPERIMENTS. The Monocopter invites modifications! Improve the balance. Add or subtract from the counterbalance weight to affect vibration. Bend the rotor counterbalance arm slightly forward and down for better dynamic balance.

There you have it, the world's simplest helicopter. Why not give it a whirl? ■



TYPE: FF Bostonian West
WINGSPAN: 16 inches
WING AREA: 48 square inches
WEIGHT: 15 grams
LENGTH: 14½ inches



One Knight in Boston

*What is it? A Loening, Nieuport or Penguin—none of the above!
 Here is M.A.N.'s first Bostonian and it looks like a lot of fun.*

by Bill Hannan

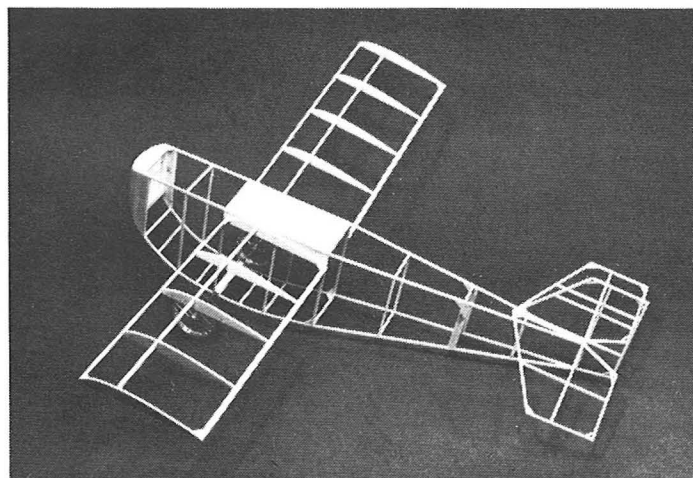
• What's in a name? "One Knight in Boston" owes its appellation to its medieval helmeted pilot. One of the sideline attractions of the Bostonian class has been the possibilities for incorporating some humor in the model names, which has perhaps inspired greater competition than the actual flying! The event originated on the East Coast, promoted by Ed Whitten in his *Star Skippers* newsletter. When Walt Mooney, of California, heard

about the category he thought it a fine concept, but too oriented to expert indoor model builders. Under the East Coast rules a weight minimum of 7 grams (less rubber motor) had been established. Walt doubled this to 14 grams, bringing the weight target within reach of young Juniors as well as fumble-fingered oldsters. The resulting sturdy models are also suited to outdoor flying. The turnout at a recent evening contest held in San Diego may be indica-

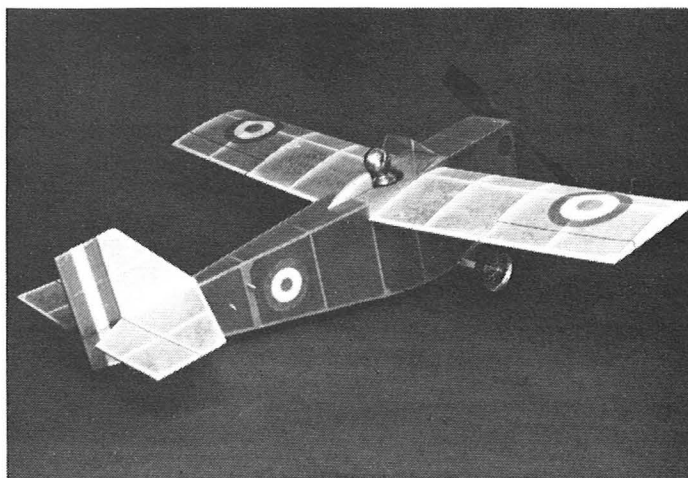
tive of the Bostonian West attraction: 32 models appeared, including some from the Los Angeles area, about 125 miles distant.

Current Mooney rules: 16" maximum projected span; 3" maximum chord; 48 square inches maximum area; 6" maximum propeller diameter; 14" maximum overall length measured from the propeller bearing.

The fuselage must accommodate a

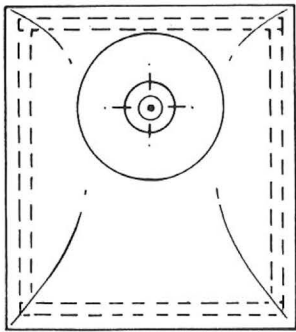


Neatly designed, lightweight structure fits the "box" requirements. "It's a 3-dimensional visual pun," explains our author.

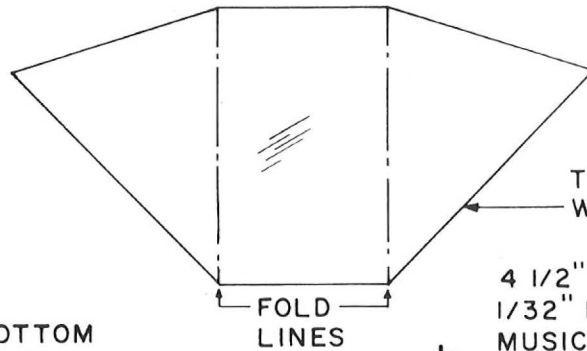


Looks sorta scale yet it's an exact "nothing." Ship has received some snide comments about looks; they were right!

ALL STRUCTURE IS
BALSA EXCEPT AS
NOTED, PRIMARILY
1/16" SQUARE STRIP



**NOSE BLOCK
FRONT VIEW**



**THIN ACETATE
WINDSHIELD**

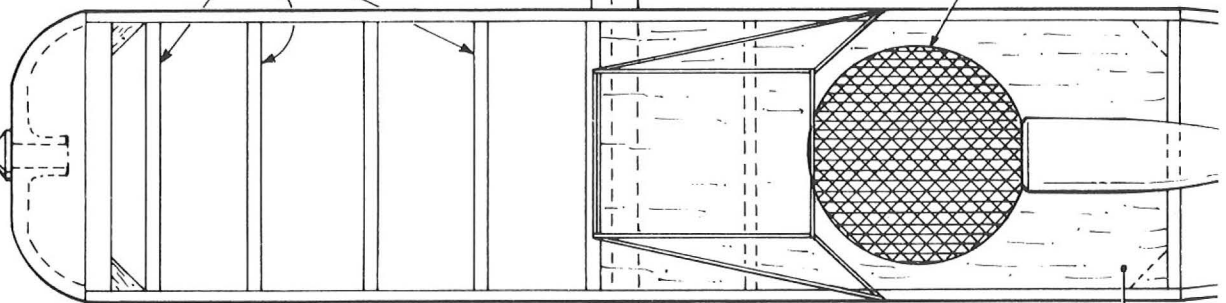
**FOLD
LINES**

**4 1/2" LONG
1/32" DIA.
MUSIC WIRE
AXLE**

**BLACK TISSUE
"COCKPIT"**

**PECK-
POLYMERS
NYLON
BEARING**

**BOTTOM
ONLY**



**REAR VIEW OF NOSE BLOCK.
HOLLOW OUT TO LIGHTEN.
1/8" x 1/16" STRIP FRAME
SHOULD FIT IN FUSELAGE
SNUGLY.**

**FLATTENED
SODA STRAW
AXLE FAIRING**

**1/32" SHEET
INSET**

**1 1/2" DIAMETER
HUNGERFORD
SPOKED WHEELS**

**MEDIEVAL
MELVIN**

**PAPER
DUMMY
CYLINDER**

1/16" SHEET

+ 3°

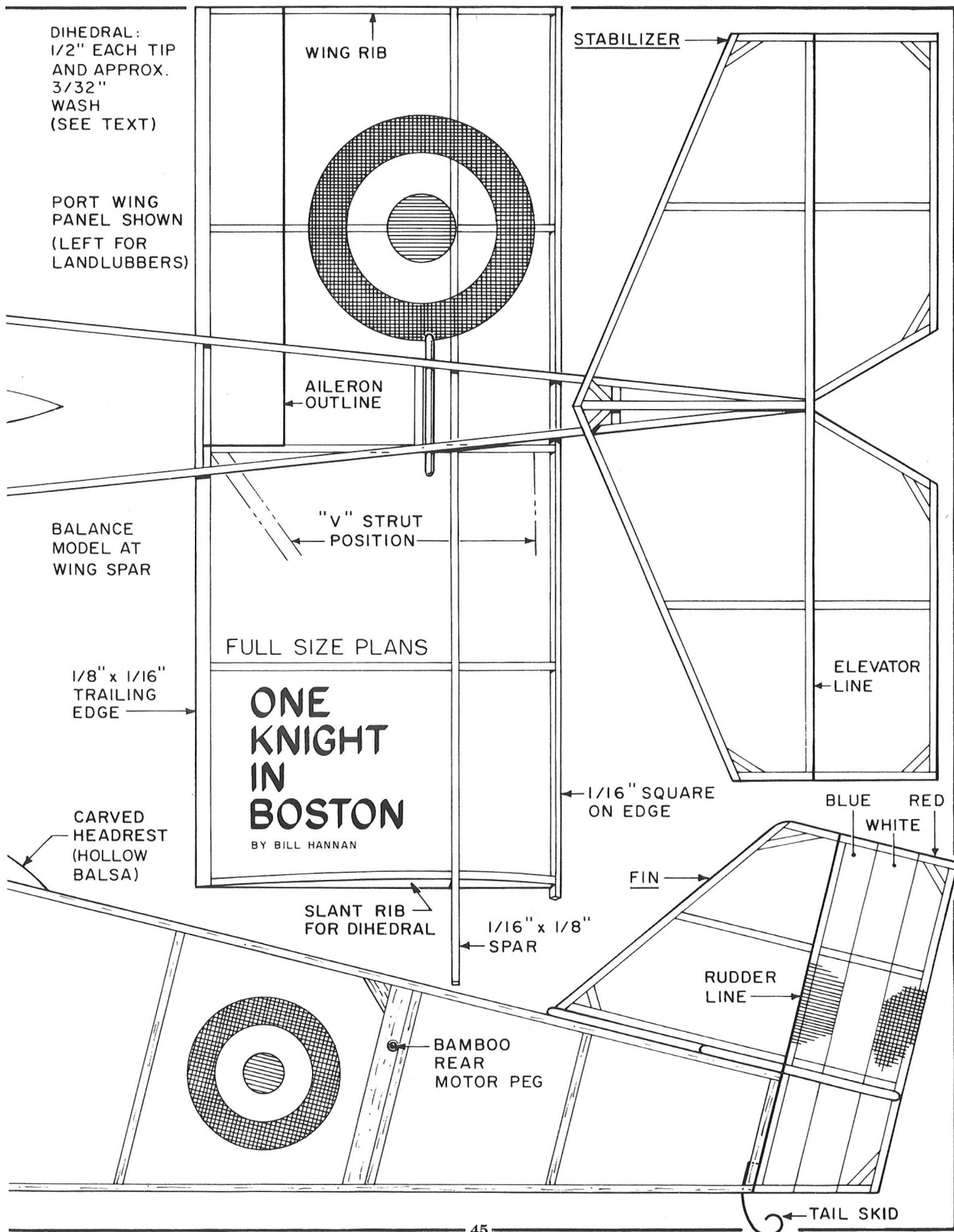
1/16" SHEET WING RIB (10)

**1/16" SHEET
BALANCE
POINT**

**"V" STRUT
POSITION**

**7"
DIAMETER
NORTH PACIFIC
PROPELLER
CUT TO 6"**

1/32" x 1/16" BASS LAMINATED



theoretical "box" measuring 3" x 2 1/2" x 1 1/2". Fuselage must support the motor(s) and form or exceed the box requirement. No motor sticks allowed. Fuselage must have a forward windshield and a window on each side, each of which must equal or exceed 1" square area. Open cockpit or parasol types waive the side window rule if side vision area meets requirements, but windshield must meet area requirement rule.

Landing gear must be practical, fixed, with two or more wheels of at least 3/4" diameter.

All flights are ROG.

Maximum propeller diameter is 6 inches.

Covering must be condenser paper or heavier tissue. (East Coast rules now specify surfaces covered on both sides, but present West Coast rules allow single-surface covering.) A "charisma factor" is employed in the East to encourage realism, originality and fine workmanship, but so far only a separate "beauty award" has been employed in California.

Individual clubs have been altering rules slightly to suit themselves. While this may have the disadvantage of not permitting standardization or direct comparison of model performances in various parts of the country, it allows for flexibility (and increased participation) on local levels.

San Diego Scale Staffel club contests often feature a special rule for a particular contest. For example, to be eligible to participate in the 4th of July event, each model had to display tiny American flag stickers. For a more recent contest, national markings were specified. First off the mark under these regulations was Bill Noonan, who came up with a flying caricature based upon a WW I German Taube. Bill elected to enclose the theoretical fuselage box horizontally. Since it seemed only logical to build an allied opponent for the Taube, our little "One Knight" in French markings was conceived. To add a distinctive note, the theoretical fuselage box was arranged vertically, accounting for its deep belly. Designed in one hour flat, and built in a very few evenings, it is sort of a 3-dimensional visual pun. Efficiency? Nope. Winning motives? Nope. Quite obviously aerodynamic considerations were outside the immediate considerations. And, true to its design goals, it has won no contests. However, it has garnered plenty of lucid comments and started more than a few conversations! Flightmaster Bill Warner offered the opinion that the fuselage was really an inverted airfoil, and was probably opposing the lift generated by the wings.

Earl VanGorder had this reaction: "I like it. That may not be considered exactly complimentary, however, as I'm known to have a fondness for ugly aircraft!"

The dean of American aeromodelers, Frank Zaic, put his views this way: "Can't

imagine all that cross-section plowing through the air...but there seems to be room enough for a bit of hydrogen."

Perhaps Mr. VTO, Dave Linstrum, paid "One Knight" the ultimate compliment with: "It's one of a kind. Lots of drag is ok! It has *super* charisma!"

A surprising number of people assumed it to be some sort of scale model, and guesses included the Loening Kitten, Nieuport-Macchi and Penguin practice trainers. And who knows, perhaps our model may be an unconscious amalgam of them all.

If you are interested in ultimate performance, this project is not for you. But if you are not averse to attracting some attention, standing apart from the crowd and generating a few smiles, "One Knight" may be your answer.

CONSTRUCTION. Note that only one wing panel is shown on the drawing, but a few moments' thought should show you that the same drawing can be used for the opposite panel. Simply project the leading edge and spar stubs out the opposite direction and tilt the end rib for dihedral.

The original model was constructed from readily available wood—with no special effort to obtain "choice" stock—but it did end up about 1 gram overweight.

Cover the plans with transparent kitchen wrap to protect them. A piece of cellotex insulation board was employed for its ability to accept straight pins easily, since most of the parts are pinned in place during construction.

Fuselage. Construct a fuselage side directly over the grained portion of the side-view drawing. The curved lower longeron is made from strips of 1/16" x 1/32" basswood laminated together with water-thinned white glue. A cardboard form can be used for achieving a smooth curve, but we simply used closely-spaced straight

pins. When the first side is dry, the pins may be removed, a second sheet of clear kitchen wrap applied, and the second side assembled directly atop the first, to help assure uniformity. When dry, remove fuselage sides from the building board; bevel the inner rear members to a slight angle where they will join, and assemble them over the top-view drawing.

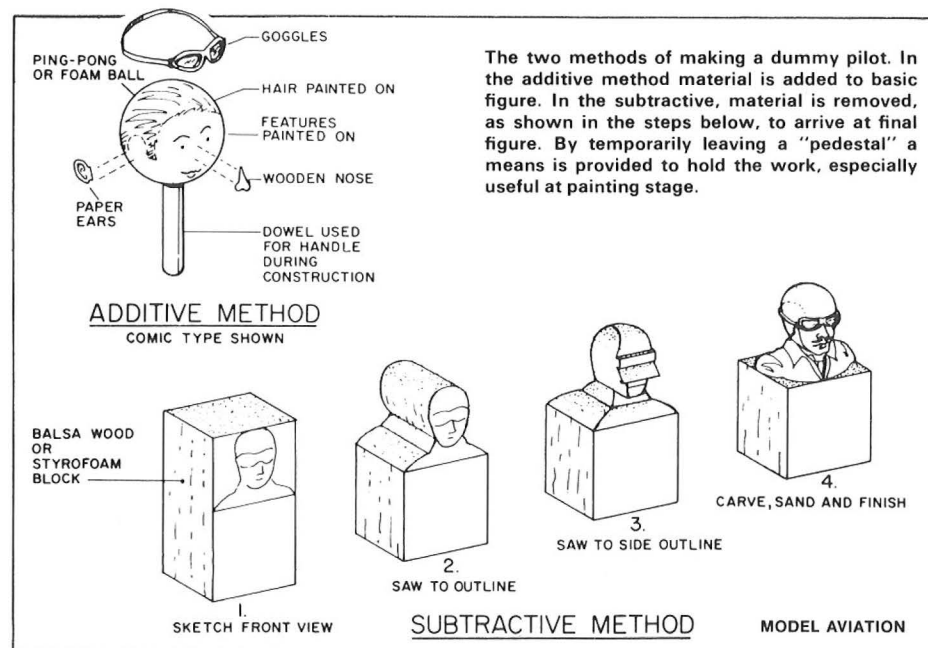
Install the crosspieces, working from the rear forward, and checking for squareness with a small triangle or cardboard rectangle. The fuselage sides should be carefully cut and cracked at the points where they become parallel, and reglued. Add remaining crossmembers, noting that there are extra ones across the bottom of the curved area. Cut the sheet balsa cockpit area inset to size and install. Hard balsa inserts accept the landing gear axle, and they can be "boxed in" as desired to accept landing shocks.

Nose block. This item was carved from a soft balsa block and hollowed out, but could be laminated from sheet, if preferred. The strip balsa "picture frame" on the back of the nose block should be a snug fit into the fuselage front, since it must be removable for winding, but tight enough to stay in position after the rubber motor runs down. The Peck-Polymers nylon thrust bearing may be secured with a drop of epoxy. While you have it mixed, another couple of drops will serve to fasten the thin music wire tail skid in place.

Wings. You can't hardly find wings any simpler than these! The only caution is to use straight stiff strips to help resist warping.

Tailplanes. More simplicity. The little diagonals, a Dick Baxter innovation apparently, help prevent tissue wrinkles.

Miscellaneous. The headrest is carved from very soft balsa, hollowed out for lightness if desired. The wing struts are 1/8"



x 1/16" hard balsa strips sanded to streamlined section. Make them long enough to allow for trial-and error fitting.

COVERING AND DECOR. Check each structural joint carefully, and reglue any doubtful-appearing intersections. Extra gussets may be added at potential stress points in case of doubt. Sandpaper any imprecise joints or projecting glue lumps to enable covering to adhere smoothly. Neatness counts!

The fuselage of the original was covered with brown tissue for a "vintage look." We used some from an art store and it has great color but is not colorfast. To avoid runs, a fine mist from a sprayer is used for shrinking. Two thin coats of Sig Lite-Coat non-shrinking dope were applied.

The wings and horizontal tail were covered, top side only, with yellow Japanese tissue and given one thin coat of Lite-Coat. These surfaces were pinned to the building board during shrinking and doped to resist warping, and left in position for about 24 hours to cure.

The fin was covered on both sides with yellow tissue, while the rudder was first covered with white. Red and blue stripes were then doped in position. The French cockades for the wings and fuselage sides have two layers of white tissue to help prevent color "show-through" from underneath.

The circles on the sides of the fuselage nose represent dummy cylinders, and *could* be made 3-dimensional if desired. Ours were simply silver paper discs with "fins" inked on.

The wing struts were colored yellow by running a felt-tip pen over them and sealing with a thin coat of clear dope.

The nose block and headrest were sanded smooth, primed and painted aluminum with several coats to build up a good thickness of paint. Our motive was to allow "engine turning" or "swirling," the overlapping circles effect seen on some vintage aircraft such as the "Spirit of St. Louis" cowling. We applied the swirls directly to the thoroughly dry aluminum paint, using an electric eraser with the tip reduced in diameter. An alternative (and perhaps less tedious) would be application of aluminum foil to the parts to be engine-turned.

ASSEMBLY. Install the wing spar stubs by making openings in the fuselage sides to assure proper incidence angles. The spars should meet, or nearly meet, at the center of the fuselage. Prop the wings up for correct dihedral and allow to dry. Cement a short strip of balsa across the spars where they meet at the center of the fuselage. Long tweezers are useful for this operation. Install the wing struts by the cut-and-try method, starting with the front pair, and allowing them to dry. The rear struts may then be cut to length that will induce any desired "wash-out" or "wash-in." Note that slight warps may also be

corrected by cutting the struts to a suitable length.

The matter of wing-wash seems to be an individual thing among modelers. Indoor technique generally involves adding a bit of "wash-in" (trailing edge of wing at its tip lower than the leading edge) to the wing panel on the inside of the turning circle. "Wash-out" (trailing edge of the wing at its tip higher than the leading edge) serves a rather different purpose in helping to prevent tip stall. Thus many models (and full-size aircraft too) employ it in both tips. Different combinations are used successfully by different builders. The point to be made here is that such adjustments are easily changed by altering the length of the rear wing struts to achieve your desired objective. More on adjustments later in the FLYING section.

Assemble the stabilizer and vertical tailplane, checking for correct alignment as viewed from both the top and rear of the model.

A piece of 1/32" diameter music wire forms the landing gear axle, and may be secured in the fuselage with epoxy. The streamlined axle fairings on each side of the fuselage are made from a partially flattened soda straw, and fastened only at the fuselage sides, allowing the wire axle to flex freely inside for shock absorption. Add the wheels of your choice. The diameter is not critical as long as sufficient allowance is made for propeller clearance, but the wheels should not be heavy. We used Hungerford silk spoked wheels to promote that antique look.

Install the headrest and the windshield. Thin silver chart tape may be added to form the windshield frame lines.

A North Pacific "Sleek Streak" plastic propeller was employed, but this gives away some of the diameter permitted by the rules. A cut-down 7" North Pacific results in increased blade width as compared to the 5 1/2" Sleek Streak. If desired, a carved or formed balsa prop could be employed. We took the easiest approach, which is probably also the reason we have not yet gotten around to fitting the optional spinner!

Oh yes, the *pièce de résistance*: The little knight may be carved from balsa or foam or vacuum-formed over carved wooden molds. Ours was painted copper, but bronze or gold should be equally regal in appearance.

FLYING. Recheck to make certain no serious warps are present, especially in the wings and stabilizer. The prototype balanced almost exactly at the wing spar, and that location is suggested for your starting point, when fitted with a short loop of 2 mm rubber for testing purposes. Test glides may be performed outdoors in a calm location, gently launching with a slight nose-down attitude. If it stalls, add a bit of clay ballast inside the nose block. If it dives, add ballast to the tailskid, or tweak

elevators upward a slight amount.

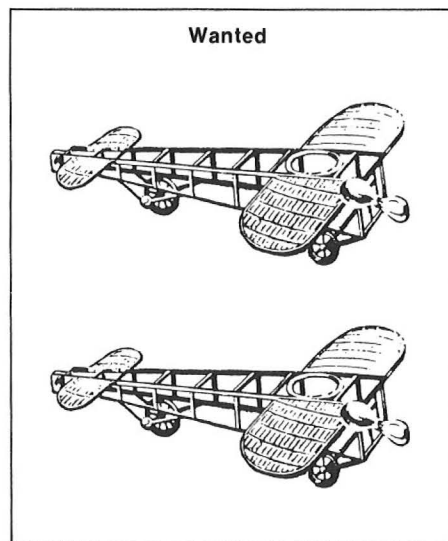
Next, wind in about 50 or 75 turns of the rubber motor and launch again. If model shows zooming tendencies under power, insert a thin downthrust shim between the top of the nose-block and fuselage. A slight stall may sometimes be corrected by means of a side-thrust shim, which tightens the turning circle. When satisfied with hand-wound flight characteristics, replace the motor with a longer lubed loop (which may bring about the need for shifting balance slightly).

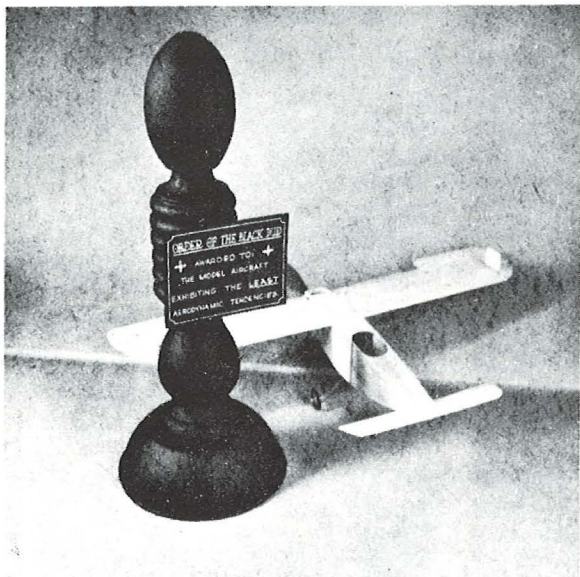
The original has been flown with 2 mm and 1/8" rubber, both indoors and outside. The wings have wash-out in both tips and the model flies in left-hand circles. For indoor trim, the circle diameter is controlled by a small clear acetate drag tab about 1" long by 1/4" high, cemented vertically beneath the left wing tip trailing edge.

IMPROVING THE PERFORMANCE. While the original "design goals" have been amply rewarded, the model *could* be made into a better performer. Walt Mooney states that an enclosed canopy would make a significant change for the better, based upon his long experience with both model and full-size aircraft. Elimination of the wing struts (assuming a stiff enough wing structure) would doubtless reduce the drag. The prototype *was* flown without the struts, but the single-surface wings could be seen to flutter slightly. Perhaps covering the wings on both sides would provide adequate torsional rigidity, but the flying speed would, of course, also change.

Could the "One Knight" be built down to the 7-gram minimum weight specified under East Coast rules? Possibly, but some provision would also be needed to make the model conform to their cabin side windows requirement as well.

As for me, I must get back to the latest inspiration; a semi-scale model of an obscure Polish aircraft. Now if only a suitable name can be found... ■





Trophy for Order of the Black Dud.

Fun Trophies

By Bill
Hannan



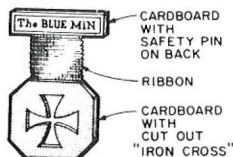
Note: Not long after this article was published, the little Blériot canard had been "de-bugged" and became a fascinating flyer.

How about a reward for the model airplane contest LOSERS? After all, they are serving an important function, as without losers, who would the winners be able to beat? So let's have a little more respect and admiration for all these important citizens! For very little cash outlay and only a small expenditure of spare time you can add a lot of fun (and incentive) to your next club contest.

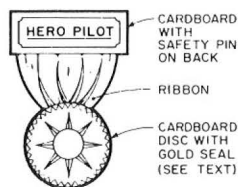
Our photograph shows one of the author's recent efforts along the line of "loser awards." Next to it is a prime candidate for the honors, a little "all-sheet" Blériot Canard which, to date, has shown almost no detectable urge to become airborne. This particular trophy was made from the top from an old bed-post, an inverted cat-food dish, some cardboard, and was sprayed flat black with a spray can. The inscription reads: ORDER OF THE BLACK DUD, AWARDED TO: THE MODEL AIRCRAFT EXHIBITING THE LEAST AERODYNAMIC TENDENCIES. With a different choice of spray cans, it could just as well have been "THE ORDER OF THE GOLD DUD," etc.

The small drawings show a few additional suggestions for fun awards. Most of the needed materials are probably somewhere around your shop or garage right now, or can be purchased very inexpensively. The drawings are intended only as general guides; you will undoubtedly be able to improve on them as you go along.

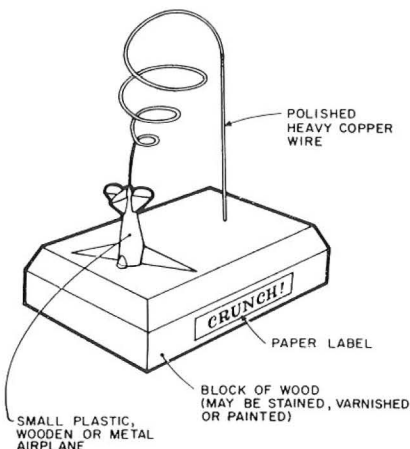
Badges seem to have a special appeal to the very young junior flyers and can be "mass-produced" rather easily. The "BLUE MIN" is our answer to the "BLUE MAX" of WWI fame. It is made from artists' illustration board, or other good quality cardboard, a few inches of colorful ribbon (check with your sis, mother, or wife), and a safety pin. The various parts may be joined together with model cement or cellophane tape.



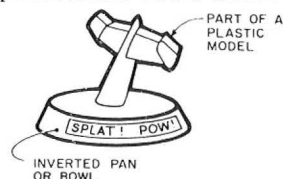
The "HERO PILOT" badge is similarly fashioned except for the gold seal which may be purchased ready-made with stickum on the back, from dime stores. An alternate approach to making the seal is to use gold or silver foil of the type that is used to wrap gift packages. With a dull pencil or ball-point pen you can emboss the design of your choice. This is done by working with the tool on the BACK side of the seal, which produces a very effective rich raised pattern on the front side. The other part of the badge may be colored with a felt pen, colored ink or dope.



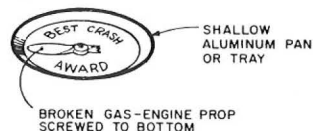
The various crash trophies are quick and easy to do, and make a nostalgic reminder of the model that came home in a sack! One of the author's most cherished trophies is a tiny, cleverly finished goodie which was awarded to me by Flightmaster Bill Warner, just after my indoor Nieuport Monoplane had smeared itself against the ceiling at Sepulveda Junior High School, in Sepulveda, California.



The trophy base can be made from an inverted pan or bowl, a block of wood or even a block of marble if you happen to have one on hand. Any plastic, wooden, or metal airplane may be suitably modified to serve as the "victim." A spray can of gold or silver paint can blend together otherwise unrelated elements. For a nice finishing touch, glue a piece of green or black felt on the bottom of the trophy. This will prevent scratches on the family mantle or bookcase and is, unfortunately, a point overlooked by some professional award manufacturers.



Now that you have produced a nice, finished job, let's add the caption. For the badges, hand lettering with pen and ink will do just fine. Apply a thin coat of clear dope over the lettering to protect it. If you don't feel up to doing hand lettering, you might try some of the rub-on lettering sheets which are carried by most art supply stores. Failing this, you might try using a typewriter. For the crash trophies, try using one of the label makers of the "Dymo" variety which squeeze letters into various colors of adhesive-backed vinyl tape.



For a really "quick-and-dirty" award that can be created in about 10 minutes, simply make a new label for an old phonograph record. Inscribe it with something ridiculous such as: "Here's a record even you can break!" Or perhaps for you U-Control fans, it might say: "First prize for a real record speed (33 1/3)!" Well, you get the idea. You may even have the pleasure of seeing some of the contestants TRYING to be losers, in order to collect your trophy!

* * * * *

TENDERFORD TRIMOTOR

HUNGERFORD HAS a better idea! Fulton Hungerford, who created so much interest during last year's Nationals with his flying scale Ford trimotor, also amazed the experts with his unlimited rubber-power entry. Created on-the-spot at the Nats, the Flying Pitchfork proved to be an excellent performer.

The basic design has been reworked slightly and reduced so that full-size plans could be included.

Construction

The fuselage frame is made from 1/4 x 1/8" balsa, which should be carefully selected for lightness and stiffness (take time to find straight, unwarped pieces). The center stick is 21" long, and the shallow angle at the lower rear should be carefully cut to provide an angle of incidence for the stabilizer. Pin or



Once queen of the airways, the fabled Ford trimotor inspired this Tenderfoot version.

tape the center stick to hold it in place on the plans while the side members are cut to size and glued on. Next, trim the crosspiece to length, and glue it atop the motor sticks. Allow the assembly to dry thoroughly and, after removing it from the building board, add a small fillet of glue to each joint for extra strength.

Wings: Select a light and unwarped sheet of 1/16" balsa for the wings. Trace their outlines onto paper which, when cut out, can be used as a pattern. After cutting the wing panels to shape, sandpaper them to remove surface roughness, and round the edges to streamline them. Slightly bevel the wing roots for a better fit at the dihedral joint. Cut the two wing mounts to shape and bevel their top sides slightly to accommodate the dihedral angle of the wings. Glue the mounts to the outer fuselage stick sides. They must be correctly located and with the high ends to the front.

Tailplanes: Cut the fin, rudder and stabilizer to shape from lightweight 1/32" sheet balsa and sand all edges. The fin and rudder are made separately for greater strength and so that 2" wide sheet balsa may be used instead of the more costly 3" stock.

Decor: Aileron markings, Ford emblems, etc., if desired, are easier to add before the



model is assembled, while the parts are still flat on the work table. Felt pen or colored tissue may be used for the markings.

Assembly

Place the wing panels in position and check the fit. Note that the dihedral angle is automatically formed by the wing mounts. However, tape or pins will be needed to hold the panels in position until the glue dries. Glue the stabilizer in place, and check for alignment, both from the rear and top view. The fin/rudder is then glued alongside the motor stick.

Bend the large rear rubber hook from 1/32" diameter music wire and bind in place with sewing thread and glue. This hook must

withstand the pull of three fully-wound motors, so it must be fastened securely. The motors tend to become somewhat tangled occasionally so, if desired, three separate hooks can be used. We prefer the simplicity of the single unit, but Fulton Hungerford used three hooks on his original Nats model.

Take a few moments to balance the props by sanding or scraping the heavy blades. This will reduce vibration and improve performance.

Using extreme caution, trim the lower portion of the plastic from each prop bearing hanger, as indicated on the plans. A molded-in groove located at the right place will serve as a guide for trimming. Do not trim away too much material or the bearing will be weakened. The excess plastic is removed for two reasons. First, greater clearance is provided for fully-wound rubber motors; second, the thread binding will close down the opening to create a snug fit over the motor sticks, which are smaller than the original Skeeter fuselage stick size. Coat the thread with glue to hold it in position. Caution: use a type of glue that will not dissolve the plastic. Finally, add a drop of oil to each prop shaft to reduce friction.

Flying

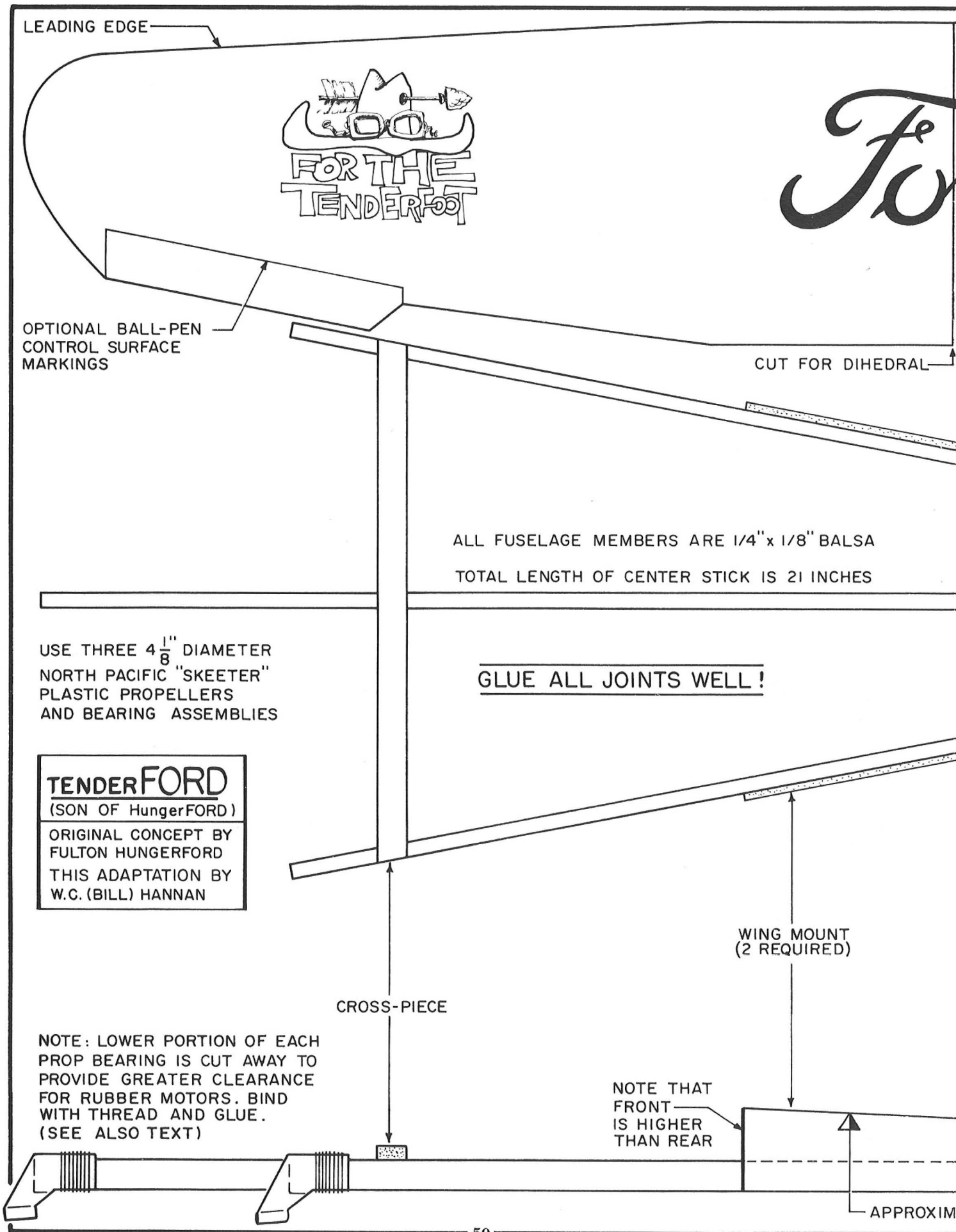
Preparation: Make three single-loop rubber motors, allowing some slack in each. The center one should be slightly longer than the outer loops. With the motors in place, the model should balance close to the point shown on the plan. If necessary, add clay ballast to the front or rear of the model. A few gentle test glides should establish the need for addition or subtraction, but power flights will be required to determine final adjustments.

Winding and Flying: A man with four hands could do it alone! Seriously, obtain the services of a dependable helper and a mechanical winder. Winding three motors by hand seems to take forever. A winder is a good investment for use on any small rubber-powered model, and with care it will last for years.

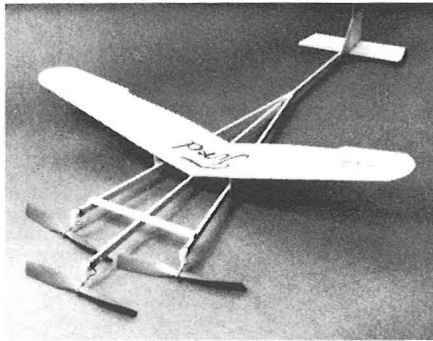
The helper must hold the model by all three props, while winding, which in itself takes some doing! We have had good results by holding the model upside down and winding from the rear. Fairly low power is suggested until you get the hang of launching the model. All props should be released and spinning before launching the model.

At first, the launch angle should be in the 30 to 45 degree range. By watching the flight and particularly the glide, the need for more or less ballast can be determined. The power circle can be adjusted by winding one of the outboard motors more than the other. The glide turn can be regulated by slight rudder bending or by means of a small amount of clay on the appropriate wing tip. If the model tends to stall under power but glides okay, tighten up the turn or increase power or both.

It is fun to experiment with this model's power. 3/32" Pirelli rubber or 1/8" brown is a good choice for early flights. After the model has been adjusted, try moving up to 1/8" Pirelli. With that size, the model can be flown on a single prop or any combination of props. With 1/8" Pirelli on all props, the Tenderford Trimotor has vertical takeoff capability. ■



rd



WING
1/16" SHEET BALSA

FRONT VIEW
(NOT TO SCALE)
SHOWING DIHEDRAL

BIND REAR HOOK WITH
THREAD AND GLUE

STABILIZER

LEADING EDGE

1/32"
SHEET
BALSA

RUDDER

FIN

STAB

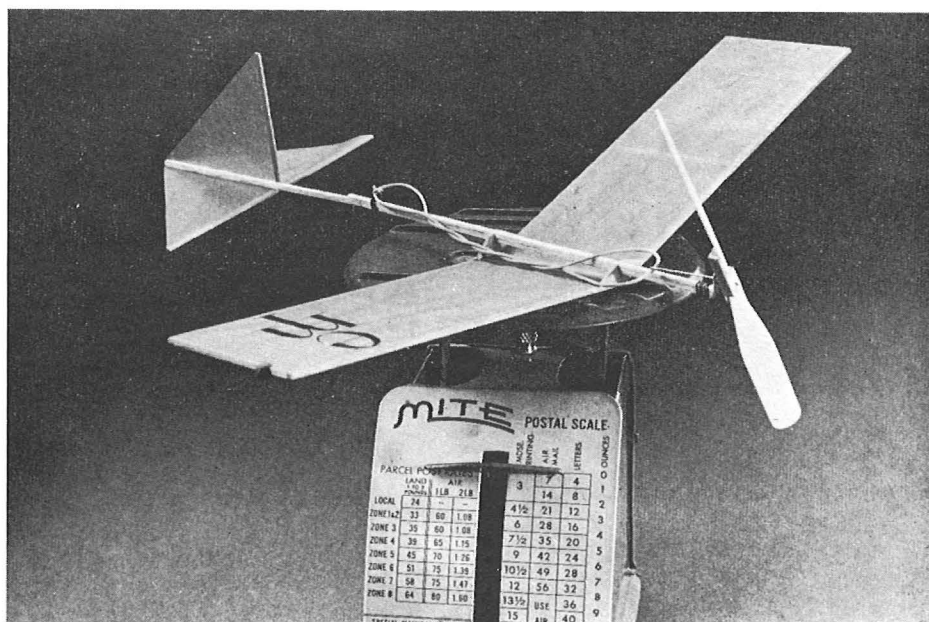
IMPORTANT: CUT REAR OF STICK AT
THIS ANGLE TO PROVIDE
STABILIZER INCIDENCE

1/16" SHEET BALSA

THREAD

MUSIC WIRE REAR HOOK

ATE BALANCE POINT



ESCONDIDO MOSQUITO

THIS simple model, if correctly constructed, can be made to perform in the average-size living room or office. It makes a fine conversation piece that will capture the attention of even non-aviation-minded visitors. The design is intended to be rugged enough to withstand the rigors of bouncing off walls and furniture that inevitably occurs when flying in restricted spaces. While the duration cannot be expected to compare with "serious" indoor models, it is quite possible to achieve several laps of the room, and contests between two or more of these tiny terrors are great fun!

Models of this general type have been popular for many years, and in fact, some of the earliest published plans were for flyers of this breed. Of the variety of interesting names which have been bestowed upon them, such as "Parlor Pursuits," "Midgets," etc., the name that seems to have turned up most frequently is "mosquito" or variations thereof. For example, an advertisement appeared in the Dec., 1910 issue of *Aeronautics* magazine, which offered for sale a tiny machine called the "Jersey Skeeter." During the late 20s, a small model named the "Baby Mosquito Flyer" was marketed by a firm called the "Mosquito Flyer Co."

Our little "Escondido Mosquito" carries on this long established tradition of balsa wood insects. "Escondido" is a Spanish word meaning "hidden," however, it is also the name of the small city in California where the author resides.

Construction: Although the model is constructed in a straightforward manner, it is important to work carefully and to bear in mind that the lighter your mosquito, the greater its duration. Since the plans are full size, you will be able to work directly over them, using a piece of waxed paper or clear plastic food wrap to protect the drawings from glue.

Wing: Select a light and straight piece of $\frac{1}{16}$ " sq. strip balsa. Usually, a search through a number of $\frac{1}{16}$ " sq. strips will reveal a few which are slightly undersize, and that size would be a good choice for this job. Additionally, the strip can be lightly sanded on all four sides to reduce the weight and remove the little hair-like fibers.

Pin down the parts to the plan using straight pins. Do not pierce the wood, but rather angle the straight pins on both sides of each strip to hold it in place. Only a small amount of glue is needed at each joint.

When the wing structure has dried, cut the leading and trailing edges in the exact center, in order to allow one tip to be raised for dihedral purposes. This tip should be raised $1\frac{1}{4}$ " above the building surface, and supported with a suitable block. Cover the wings on the top side only, using the lightest grade of tissue paper that you can obtain. Condenser paper is a good choice, since it is very thin and non-porous, but superfine Japanese tissue can be used instead. Do not shrink or dope the covering, since this might cause warping.

Wing mounts: Cut the wing mounts to shape from fairly hard $\frac{1}{32}$ " sheet balsa. Note that the two mounts are different, to provide for an angle of incidence. These mounts also help to strengthen the wing dihedral joint.

Fuselage: Select a light but stiff section of $\frac{3}{32} \times \frac{1}{16}$ " balsa for the fuselage. It is important that the material be rigid enough to resist "bowing" under the strain of a fully wound motor. Sand lightly, and notch for the $\frac{1}{16}$ "-sq. tail boom. Note that the tail boom is offset, as shown on the plan top view, to enable the model to fly in small circles. Glue this joint sparingly, since the angle may need to be slightly altered to suit your particular flying space limitations.

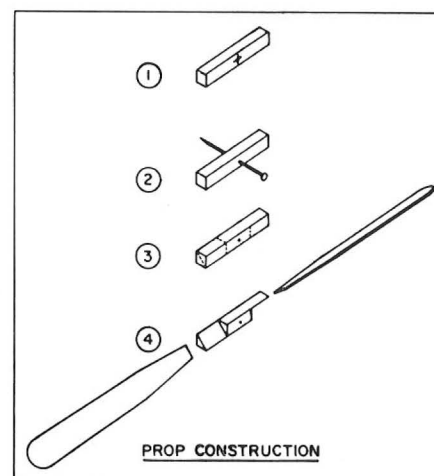
Metal parts: The propeller shaft and rubber motor rear hook are bent to shape using needle-nose pliers. Music wire of approximately .015 diameter will work well. The prop shaft bearing is made from aluminum or dural sheet stock, which is drilled to accept the prop shaft, then bent as indicated on the drawing. Roughen the portion of the aluminum where it contacts the fuselage, and glue in place. A few turns of sewing thread will greatly strengthen the joint. Glue and bind the rear wire hook in similar fashion.

Tailplanes: Glue the $\frac{1}{16} \times \frac{1}{32} \times 3\frac{3}{8}$ " balsa stabilizer leading edge onto a sheet of tissue paper. Allow a few moments for the adhesive to set, then trim the tissue to the triangular shape shown on the plan. This is

easier than trying to glue the stick onto an already cut triangle of tissue. The rudder is constructed in the same way.

Glue the stab onto the lower side of the tail boom, using the plan top view as an alignment aid. Next, glue the rudder to the side of the tail boom.

Propeller: The prop hub is made from a medium-weight piece of $\frac{1}{8}$ "-sq. balsa strip. After cutting to length, mark the exact center of the hub, and carefully push a thin straight pin through it. Do this slowly, and try to keep the pin properly centered as viewed from the end and side of the hub, so that the finished prop will not wobble. Next, measure and mark off the portions of the hub which will be cut away to receive the prop blades. A diagonal line should be drawn on each end of the hub to serve as a guide for the depth and direction of each cut. It is safer to cut the wood away a little at a time, rather than trying to remove the entire corner at once.

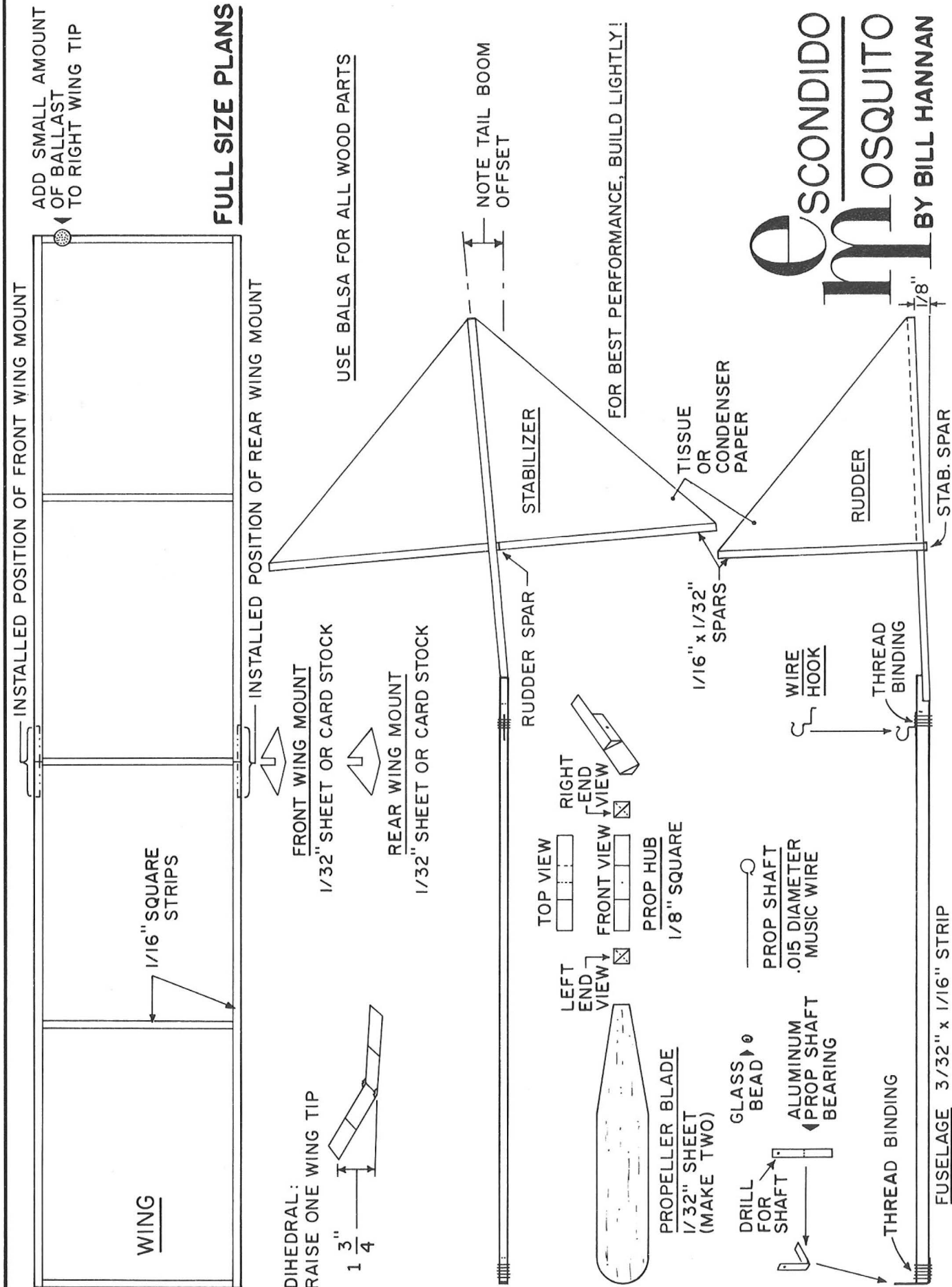


The blades themselves are cut from $\frac{1}{32}$ " sheet balsa. Using a paper pattern as a template, make the two blades as nearly alike as possible, then carefully sand and slightly round the edges. When gluing the blades onto the hub, be sure to check that they are properly centered. After the glue has dried, place a thin wire through the prop-shaft hole, and check the propeller balance. One blade will probably swing to the bottom, indicating the need to be lightened. A little sanding should take care of the problem, and while absolute perfection is not required, the better the balance, the smoother will be the flights.

Slide the prop shaft through the fuselage shaft bearing, and add a glass "seed bead" for a thrust bearing. After inserting the shaft into the prop hub, bend the end of the shaft into a "U," using needle-nose pliers, and force the "U" into the front of the prop hub. Apply a film of glue over the area to keep the shaft in a secure position. A tiny drop of oil applied to the shaft will help reduce friction.

The wing may now be installed. The mounts should be a fairly snug fit on the fuselage, which will hold the wing in place, and yet permit wing shifts for balance purposes.

Power: This model requires only a very tiny amount of power, and in fact, too much power should be avoided. The exact power required will depend upon the weight of the finished model, but here are some suggestions for a start. If $\frac{1}{24}$ "-sq. rubber is available in your area hobby dealer's shop, give that a try. A single strand of it may prove adequate. Simply tie a loop in each end of the strand, or if you prefer, the loop



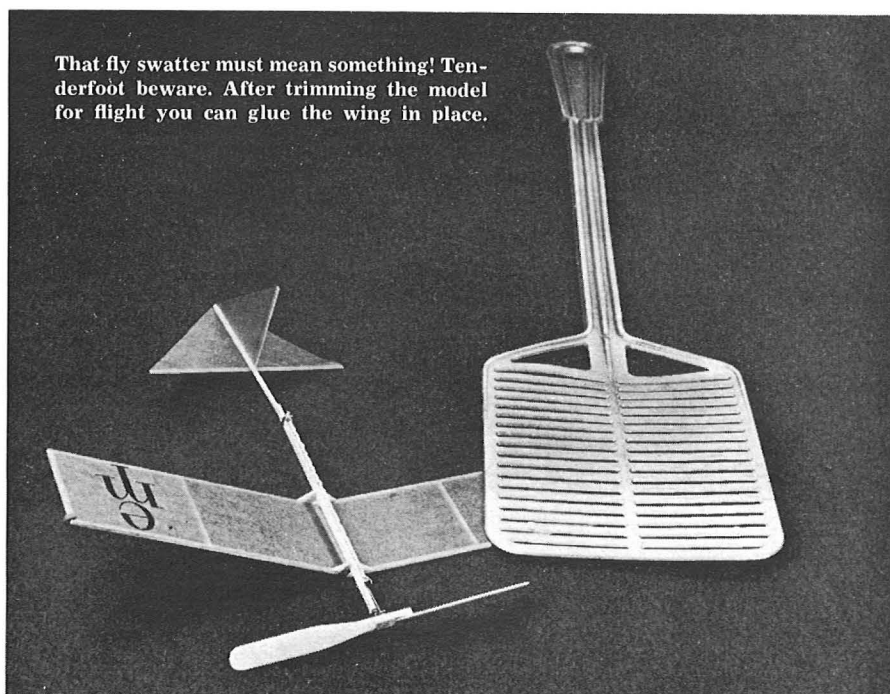
at each end may be secured with a couple of turns of sewing thread. Be sure to trim the loose ends of the rubber so that they will not rub against the fuselage, which wastes power.

Or, try a single strand cut from a common office-type rubber band. These vary widely in size and quality, so some experimenting will be needed. Another possibility is to slice your own thin rubber strand from a wider piece, using a sharp razor blade and a straight edge.

If your model turns out to be very light, you may wish to investigate the use of elastic shirring thread. This is the type of elastic used in the tops of socks, shorts, and similar wearing apparel. Again, size and quality varies from brand to brand, so do a little looking around. In the case of the tiny sizes of this substance, a single loop (two strands) may be needed to provide the right power.

Flying: After you have installed the rubber motor, try a gentle hand glide. Shift the wing slightly forward or rearward as required to achieve a gentle descent. Next, try a few turns of the prop, and launch again. If all goes well, try a few more winds and repeat. We prefer to fly our mosquitoes in quite small right-hand circles. In order to achieve this (assuming no warps), it may be necessary to add a *small* amount of ballast to the right wing tip. Although modeling clay is the accepted ballast material, it has a disadvantage, in that dropped pieces may become imbedded in the rug and cause stains. Needless to say, this does not go over too well with the lady of the house. As an alternative, try an artist's kneaded eraser, or typewriter cleaning dough. This material can be handled about like clay, but it will not stain rugs, etc., since it is non-greasy.

Remember to launch the model gently, with the propeller turning. It may also help

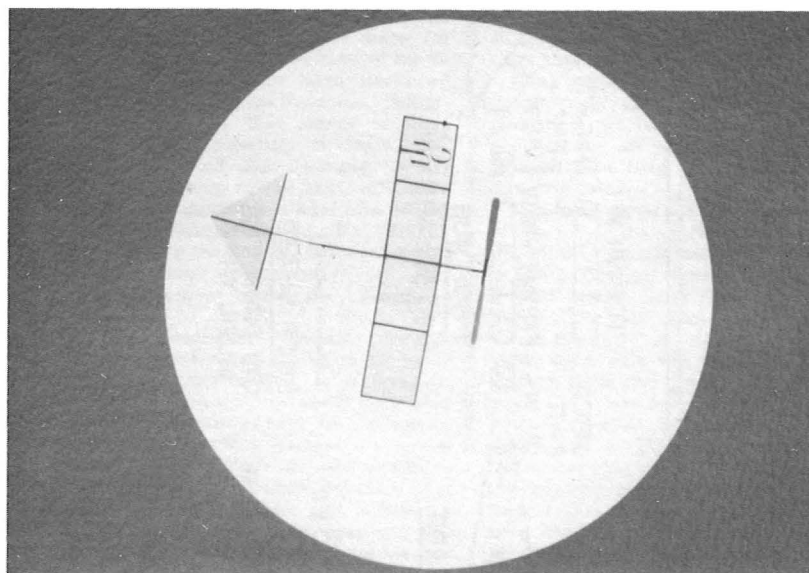


to release the model in a slight right bank to give it a hint of what it is expected to do. If your flying area is fairly large, you may be able to fly in large diameter circles without needing wing tip ballast. On the other hand, if your flying site is unusually small, it may be necessary to offset the rudder still farther, and add additional wing-tip ballast. All of this can be determined during testing. If the model should happen to crash, the damage can be easily and quick-

ly repaired. Remember, however, that the added weight of the glue required for repairs may bring about the need for re-trimming of the model.

With a little practice, you should find it quite easy to launch the model, watch it make several laps of the room, and have it return to your hand. This may be the answer for the fellows who like free flight, but don't want to chase models! ■

CAUTION: The Escondido Mosquito, though simple in appearance, requires careful material selection, delicate construction and skillful adjustment for flight. It is not a rank beginner's project.



L.E.M.
(Lunar Excursion Mosquito)



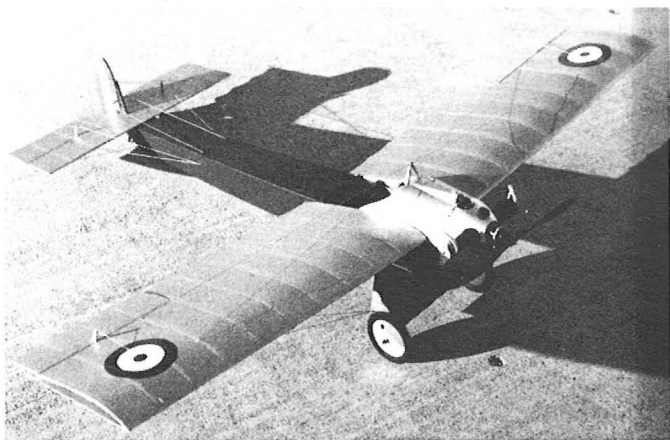
Escondido Mosquito travelling "Economy Class"
with other models on their way to Europe.

The design was also featured in the 1970-71 Aeromodeller Annual. An iron curtain variation, appropriately enough, flew to the left . . . Happily, mosquitoes are apolitical, so take your choice!

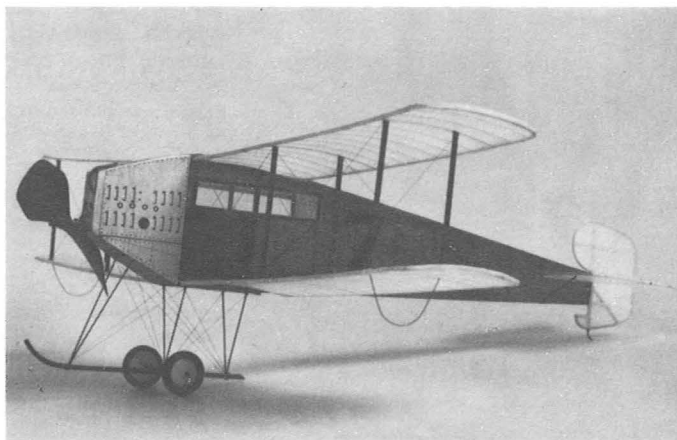
An Escondido Mosquito was taken to Europe during 1975, and was flown inside an Air France Boeing 747 high over the Atlantic (very briefly owing to turbulent cabin air); in Maurice Bayet's *Modele Reduit D'Avion* Paris magazine office; in the de Havilland and Mosquito Museum of England, and in Scotland.

REFLECTIONS FROM THE SCRAPBOOKS

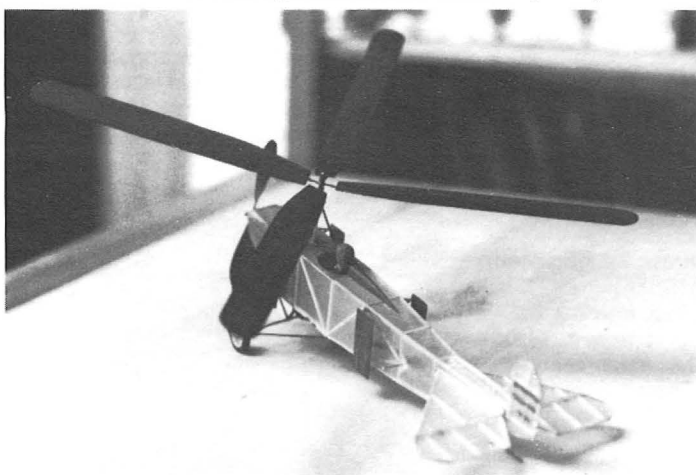
We have been gratified by the kind letters relating to our Scrapbook of Scale volumes. Quite a number of photos showing models constructed from the plans and 3-Views have been received, and a few examples are shown.



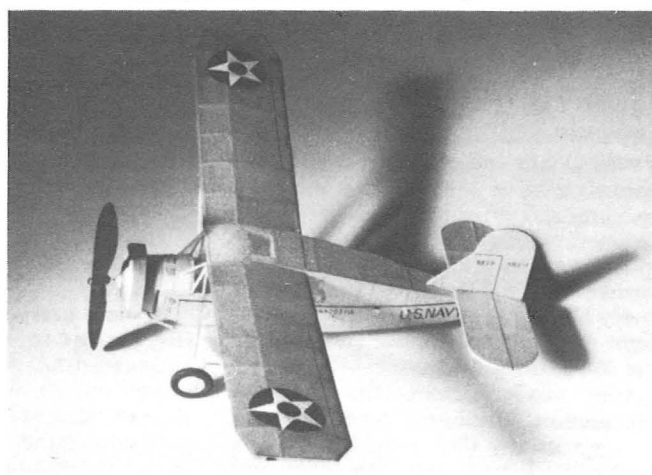
1984 U.S. Nationals-winning Farman Moto-Aviette by Larry Kruse.



Tomoji Nishina's Avro G from Japan.



Chauvière Peanut by Roger Aime of France.



Shoichi Uchida's Bellanca Skyrocket from Japan.

Additionally, we have heard from people who could relate personally to some of the featured aircraft. For example, Bill Brown, of Brown Junior model engine fame, took some flying lessons during 1935 in Fairchild 22s. Those craft had dark blue fuselages and orange-yellow wings according to his log book.

Hewitt Phillips, long-time NACA/NASA staff member, believes the NACA Fairchilds had black fuselages and yellow wings.

Florida indoor modeler Walt Everson co-piloted a full-size Boeing 247 (Army C-73), and well remembers retracting the landing gear, which required about 40 strokes of a long ratchet bar for each wheel, and another 80 tiring strokes to lower them!

Johnny Miller, first man to loop an Autogiro, also piloted Boeing 247s.

Ray Malmström, now retired from art teaching in England, still keeps his creativity flowing, as indicated by his response to Scrapbook Volume Two.





Linda Price, lady aeronaut extraordinaire.

BAPTISM UNDER FIRE

Why would anyone in his right mind want to arise at 3:30 a.m. on a Sunday morning and drive for hours in fog and darkness through unfamiliar territory to an obscure location near Perris, California? How about an invitation from a lovely blonde aeronaut to join her for a flight in a hot-air balloon! At least that was the plan.

After finally locating the specified intersection, absolutely nothing could be seen in any direction. But then, a pickup truck hove into dim view, and with a wicker basket in the back . . . a sure sign of a balloonist. We followed it into a field just as the first glimmer of daybreak appeared, revealing several other balloon crews all awaiting improved visibility.

Our crew, meeting as a group for the first time, consisted of balloon owner/pilot Linda; Diane, semi-experienced helper; a bright-eyed and alert youngster of about twelve; and two rank novices, including yours truly. Six a.m. was the scheduled time of launch and we were all raring to go. Alas, Mother Nature wasn't and we began to wonder if the fog would ever lift. The object of such an early start, of course, is to avoid wind gusts, which are even more distressing to balloonists than to modelers.

Seven a.m. and still fog . . . calm, though (moreso than our nerves). Eight a.m. and the veil began to lift, along with our spirits. Another crew, eager to go, began preparing its balloon for flight, while we watched with more than casual interest, since we "first-timers" were expected to learn the routine immediately. Soon a second crew sprang into action, and with that our "Commander" gave the order to start unloading our balloon equipment. Although relatively

new to the sport, Linda radiated enthusiasm and confidence, contagious even to those of us who were still wondering what we were trying to do. My own background included a fair amount of aircraft ground-handling experience, but my knowledge of lighter-than-air craft was almost nil . . . which became quite obvious when trying to carry out assigned tasks. Another of our crew, however, was equally inept, so we could at least share embarrassment! Filling a hot-air balloon is not an easy task. The envelope must be removed from its canvas bag and arrayed on the ground properly, shroud lines must be attached to the basket, and the propane burner installed.

The initial filling of the envelope involves the use of an engine-driven fan, which swells the balloon to a fair percentage of its volume, but still leaves it reposing rather helplessly on its side. The next, much more exciting step, requires someone to enter the balloon with a propane-fueled weed-burner, which heats the trapped air, causing the envelope to rise to a more nearly vertical position. Then the basket-mounted main burner is lit, belching forth a huge tongue of flame, sounding much like a Dyna-Jet engine when the "blast valve" is opened. The heated air swells the balloon to a ripe fullness, and it is ready for flight.

By now everyone was holding on to the basket to keep it down. Linda conducted her final checks, then motioned me aboard. The tiny traditional wicker basket is sturdy and nicely padded around its periphery, which is somehow reassuring, as is the "friendly fit" of the fuel tanks, instruments, pilot, and passenger within its confines.

With a blast of throttle and "all hands let go," we were off and accelerating upward with deceptive smoothness . . . rapidly gaining altitude with an almost imperceptible sense of motion. It seemed not so much that we were rising, but rather that the ground was falling away beneath us. One of the most impressive aspects of balloon flight is the remarkable acoustical sensations. In between the authoritative audio blasts of the burner, all is stillness. Dogs barking and conversations from earth-bound mortals carry up with startling clarity, the result of moving at exactly the same speed as the air.

We gently wafted over the fascinating Orange Empire Railway Museum, enjoying a wonderful and unique top view of the rolling stock below. Gradually we drifted over a larger empty field and, suspended at about 350 feet altitude, had the opportunity to realize a long-held whim . . . that of tossing out some tiny balsa gliders! The first, not quite correctly adjusted, entered a tight-to-the-right spiral and descended to the ground in about 45 seconds. Glider number two boomeranged back to the

launcher like a movie running backwards! The next try resulted in a perfect flight of approximately 90 seconds duration. Not bad, considering the damp air. The junior member of our ground crew adroitly recovered both models, which were later given to him for his efforts at anti-litterbugging.

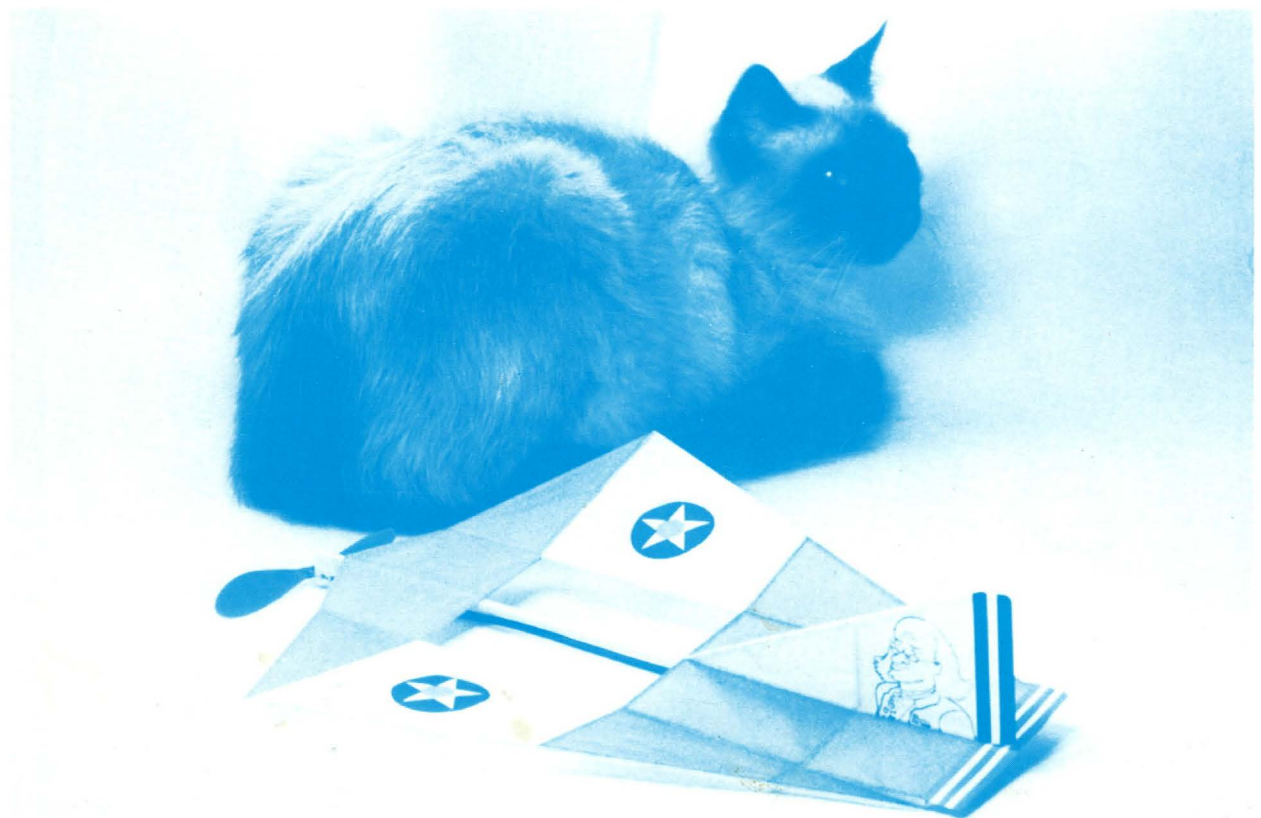
I suggested to Linda that had we been near a thermal, the gliders might have performed better. She shook her head and explained that unlike model aeroplanists, balloonists prefer *NOT* to encounter thermals. It seems they can drag balloons spinning upwards in an alarming manner to excessive altitudes, and are difficult to escape! Live and learn.

At last our idyllic aerial adventure was drawing to a close . . . rather like having to wake up from a dream about flying without the need of an aircraft. A suitable landing site was beneath us, and with great precision, Linda brought her marvelous balloon to a gentle landing. Our total time aloft was about 44 minutes, yet it seemed only moments. Certainly I felt much younger than when we left the earth! Truly a fantasy fulfilled. ■



SIGN-OFF: We thank all who made this book possible by their support of the **SCRAPBOOKS**, Volumes One and Two. Other volumes may be forthcoming . . .

MODELS and MUSINGS



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